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AN ALTERNATIVE APPROACH TO U.S. ARMY TRANSFORMATION

by

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AN ALTERNATIVE APPROACH TO U.S. ARMY TRANSFORMATION

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ABSTRACT

This thesis examines the concept of developing transformation strategies to determine alternative paths that the U.S. Army could follow in preparing for future conflict. It draws insights from chaos theory and organizational theory to develop a theoretical framework useful in guiding military transformation. It also surveys other prominent ideas about organization, technology, and doctrine to assess the alternative approaches to changing existing military forces. The result of this work is to synthesize concepts from multiple disciplines and determine how these insights might affect decisions concerning, structural and organizational changes. Further, this thesis addresses the need to balance our reliance on complex technological systems with doctrinal and organizational changes. Finally, it calls for a unified theory, which explains the emerging nature of warfare in an information age, and how we intend to fight. The goal is provide military decision makers with insight into an alternative perspective on the future of warfighting and the methods that the military can follow to successfully transform itself for an uncertain future.

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I.   INTRODUCTION

A.   BACKGROUND

Throughout history, mankind has struggled to define the nature of war. From Sun Tzu, to Clausewitz, to Cebrowski and Owens, we have labored to enumerate its characteristics, principles and truths. We have established theories and models to give us an intellectual framework to develop strategies, both political and military. A nation's military effectiveness often hinges on its interpretation of war, which leads directly to how it organizes for and conducts warfare. The details of how we will fight, and what our "theory of victory" is, are captured in our operational doctrine- whether it is Blitzkrieg, Air Land Battle, or Swarming.   The battlefield is where the litany of theories, frameworks, models and doctrine are tested, with bloodshed and destruction often the result. Nevertheless, as those who have fought have always realized, the battlefield and war have a life of their own. Over the years, people have accounted for this inexorable fact of war. The best articulation of this uncontrollable battlefield force is military theorist Carl von Clausewitz's idea of friction. In his own words;

> Every thing in war is very simple, but the simplest thing is difficult. The difficulties accumulate and end by producing a kind of friction that is inconceivable unless one has experienced war… Countless minor incidents–the kind you can never really foresee-combine to lower the general level of performance, so that one always falls far short of intended goal… Friction is the only concept that more or less corresponds to the factors that distinguish real war from war on paper. (1985, p119-120)

This idea of friction is an elemental force in war, and is fundamental to defining the environment in which our military forces must successfully operate. Is friction a mystery? Is it something that we can harness and control, or is it that no matter what we do it will always exist? I believe that there is a theory that helps to explain this friction, and that is chaos theory.

Chaos theory is a scientific body of knowledge that explains the nature of how seemingly random and unpredictable systems function. These unpredictable or "chaotic" systems exhibit the characteristics of nonlinearity and sensitivity to initial conditions

resulting in a nature where countless minute differences in input can create entirely different outcomes for the system depending on the initial set of factors. (Beyerchen, 1992) Chaos theory attempts to explain and provide a level of predictability about the behavior of highly complex and dynamic systems where it is difficult to define and isolate the multitude of variables effecting outcomes. If we perceive warfare as complex and dynamic system it can be interpreted as a chaotic system. Therefore, application of this theory to warfare may help the US military develop alternative operational concepts on which to base its organizational structures, choices of equipment and technologies and bases of doctrine. Chaos theory provides a good understanding of what causes friction and provides a framework to examine war. Through practical application, chaos theory might lead to an alternative approach to military operations by defining, or redefining the central aspects of war.

B.   RELEVANCE & PURPOSE

There exists a large group of military thinkers and senior officers who believe that technology has given the US military the ability to lift the fog of war and negate the forces of friction (Owens 2000). Through military transformation, America will harness the power of information and will create a frictionless battlefield. Information dominance is the bedrock necessity on which the US military is basing transformation, future operational concepts and emerging doctrines. The problem, as I see it, is that most of what we are implementing is designed to make us better at the type of warfare that we have already mastered. With our "new war" on transnational terrorists, and a definite trend of warfare toward the lower intensity end of the spectrum, how effective will our synchronization-centered operational concept turn out to be? What are the consequences if the current US operational paradigm is based on a flawed or misinterpreted understanding of war? By examining an alternative paradigm, the US military would have the opportunity to assess our current position and chart a course to increased effectiveness over a greater range of warfare styles.

The purpose of this thesis is to explore a new understanding of warfare and alternative operational paradigms by means of applying chaos theory. The application of theoretical framework based on chaos may derive insights into the direction that

transformation could take for future forces. Based on those insights a new operational concept could be developed requiring adjustments in organization, technology and doctrine to fully capitalize on its effectiveness.

C.   METHODOLOGY

This thesis will be heuristic in nature and will follow three basic steps. I will open with a discussion of Admiral Owens' book *Lifting the Fog of War* to highlight a commonly held view of transformation and the nature of war. I will then outline and discuss the US Army's current operational constructs, which are based on execution of "precise synchronization" of a complex system of systems. I will then outline an alternative operational framework by showing how chaos theory can be applied to warfare to derive a set of tenets that explain the essential nature of warfare. I will elaborate basic formulations of chaos, and suggest methods to operationalize them.

Second, I will analyze a diverse array of prominent bodies of knowledge, concepts and ideas that are currently in play in three military dimensions: organization, technology, and doctrine, to determine which are optimized for future conflict, and the nature of that warfare. Third, I gather insights and outline paths that the US military could follow in fielding an alternative future combat force.

Chapter II outlines the ideas of the revolution of military affairs, and discusses Admiral Owens's concepts discussed in his book *Lifting the Fog of War*, and his vision for transformation. Chapter III reviews the US Army's current operational paradigm, and then describes the application of chaos theory and what it reveals about warfare. Chapter IV is a review of what organizational theorists suggest for organizing and coping with a given environment. The discussion is extended to an appraisal of three organizational approaches to changing US Army combat forces.

Chapter V deals with a description of the Army's technological system of systems approach to transformation, known as "battlefield digitization". It highlights the inherent drawbacks, and provides an alternative method for achieving new information structure within combat forces. Chapter VI assesses alternative operational doctrines, in the form of the Marine Corps doctrine, rapid decisive operations, and finally the operational

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concept of "BattleSwarm". The last chapter briefly describes the implications of an alternative operational concept, based on insights from chaos theory, for the transformation of the US Army.

II.   THE CURRENT VISION OF TRANSFORMATION

A.   LIFTING THE FOG OF WAR

One of the leading schools of thought on how the US military needs to change stems from an ongoing debate about a "revolution in military affairs" (RMA).   The debate is far from over, and there are many differing perspectives and points of view on this issue of what type of impact will the information revolution have on warfare.   In Michael O'Hanlon book, *Technological Change and the Future of Warfare* (2000) he describes four RMA schools of thought: system of systems, dominant battlespace knowledge, global reach & global power and vulnerability.   Though these schools of thought differ according to O'Hanlon they are all based on the hypothesis that advances in technology (computers, sensors, existing weaponry and finally new types of weapons) lead to two conclusions;

> First, if properly exploited and integrated in to military organizations, tactics, and concepts of operations, these technical trends can soon add up to a revolution in military affairs that will constitutes the greatest advance in warfare since the advent of blitzkrieg and aircraft carriers….

> Second, U.S. adversaries, even if considerably less technologically sophisticated and wealthy than the United States, will also benefit from this contemporary RMA… and thus be able to challenge U.S. operations much more than Iraq did in Operation Desert Storm or Serbia did in Operation Allied Force. (2000, p. 3)

Cohn, Eisenstadt, and Bacevich in *Knives, Tanks & Missiles': Israel's Security Revolution* (1998), outline an alternative framework about competing thoughts about the RMA.   These authors outline four major strands of thought within the American military/academic establishments on the nature of the RMA. These consist of: system of systems, uncertain revolutionaries, Gulf War veterans, and skeptics (Cohn et al 1998. pp. 3-13).   Each of these camps maintains a particular view concerning the reasons for, the implications of, and the direction needed for military change. The "system of systems" camp believes that the RMA is well underway, powered by the rapid maturation of information technologies. It believes that the U.S. has created a system of highly technologically advanced systems that allow the US the unprecedented military capability to see and strike virtually anything it wants, while maintaining situational awareness and

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control throughout a given battlespace, using an advanced C4ISR network. This faction views the current RMA as not "merely *a* revolution in warfare but *the* revolution in warfare, a change that dwarfs all others …and that only the United States can master". (Cohn, et al. 1998. p. 4)

The "uncertain revolutionaries" believe that we are at the beginning of an RMA but the future and course that we should take is unclear. They believe that the foundations of all RMAs are "a synthesis of technology, operational concept, and organization to achieve quantum improvements in military effectiveness (1998, p. 8)." The "Gulf War veterans" perspective, as Cohen sees it, represents the predominant view within the military establishment (at the time of publishing, 1998) that the RMA has come and passed, and that our current operational concepts, doctrine, and organizational structures have been validated, and that America simply needs to continue investing in training, pay, operations and maintenance. These conventionalists understand that our overmatch in the conventional arena could drive warfare toward the irregular and low intensity, to include terrorism. In light of the September 11th attack this movement of warfare toward the irregular seems confirmed. Nevertheless, this school maintains that conventional military superiority is still the foundation for America's strategic and regional power.

The last school of thought identified by Cohen, et al. consists of the skeptics, who maintain the point of view that the whole idea of revolutionary change in warfare is misplaced and can be dangerous. This school believes that it is the human element that is the dominant factor in warfare. The heart of any RMA is the result of basic change in how the military profession and culture view warfare. Military thinker Andrew Krepinevich echoes much the same assessment on the nature of RMAs. His Center for Strategic and Budgetary Assessment (CSBA) has outlined no less than nine divergent views of the RMA. These range from the lack of a revolution or even denial of a revolution, to the perspective that we have entered a period of continuous change (CSBA Online, 2002).

For purposes of this thesis, I will take the simpler view that we are in the midst of an RMA, but for practical purposes, that all the different camps are simply subsets of four approaches to dealing with change. The originator of this framework is Professor John

Arquilla of the Naval Postgraduate School who uses it in lectures and class discussions to determine the nature of concepts about military affairs. This framework consists of a combination of two basic aspects of warfare, the technical and the conceptual. To realize change, the military has to manipulate some combination of these two aspects. The first is to change based on advances in the technical aspects, which enable older organizations to fight in new ways (new technical / old conceptual). A second school believes that RMAs are based not so much on changing technology, but on developing new organizations and doctrines that drive new capabilities (old technical / new conceptual). Still others believe that you need both new technologies and new structures and doctrines (new technical/new conceptual). Finally there is (old technical /old conceptual), which is the belief that basic change is unnecessary (personal communications, Arquilla, 2001). Running through all camps is a debate about whether there needs to be a fundamental change in how the military thinks about fighting. Though there are arguments for all positions, the current state of affairs seems to be that technology has become an end, rather than a means to powering the current RMA.

Many cite retired Admiral Bill Owens as the force behind the pure technological camp. The realization of his system-of-systems approach is based on the ideas postulated by Vice Admiral Arthur Cebrowski in his paper on network centric warfare (NCW) published in *Proceedings of the Naval Institute*, early in 1998. In it he lays out what he believes is the most important RMA that has affected the U.S., one that allowed the US military to transition from a platform-centered attrition style of warfare, to network-centered "faster and more effective warfighting style characterized by new concept of speed of command and self-synchronization" (Cebrowski and Garstka, 1998, p. 6). According to Cebrowski, NCW draws its power "from fundamental changes in American society. These changes have been dominated by the co-evolution of economics, information technology, and business processes and organizations" (1998, p. 2). In light of the current economic recession that started at the end of the 90s, and business processes that are under intense public scrutiny, the validity of the bedrock concepts on which network-centric warfare was structured is likely to continue to be a subject for debate.

In his book *Lifting the Fog of War*, Owens outlines the direction that he believes the US military needs to travel to produce a revolution in military affairs. Admiral Owens rose to Vice Chairman of the Joint Chiefs of Staff in 1994 and 1995. He was the architect of the effort to reinvigorate the Joint Requirements Oversight Council (JROC) as a tool of defense reforms. This was achieved by coupling the Joint Warfare Capabilities Assessment (JWCA) process with the input from the Chairman's Program Assessment to the defense budgeting process, thereby placing more priority and support for Joint systems within the DoD (Owens 2001. pp 172-74). Owens was a key player in the process of transformation while he was in the service, and now that he is retired, he is still pushing for real change throughout all the armed services. In this chapter, I will examine Admiral Owens' road map for change to see if there is an alternative approach that would be better pursued.

B.   A CATALYST FOR CHANGE?

Owens believes that the engine of change for our military lies with advances in information technologies. The RMA "seeks to use new technologies to transform the way in which military units can wage war (2001, p.10)" He sees technologies as the solution to the primary issues that face all battlefield commanders. One's understanding of the battlefield by proverbially seeing oneself (friendly forces), seeing the enemy, and seeing the terrain (i.e., how the terrain will effect both friendly and enemy). The larger problem, which faces all commanders in war, is coping with war's uncertainty. These are the concepts of friction and the "fog of war" that Carl von Clausewitz wrote about in *On War* that is so often quoted by military thinkers. Clausewitz wrote:

> War is the realm of uncertainty; three quarters of the factors on which action is based are wrapped in a fog of greater or lesser uncertainty. (On War, Howard & Paret ed, 1984, p 97)"

> The military machine-the army and everything related to it-is basically very simple and therefore seems easy to manage. But we should bear in mind that none of its components is of one piece: each part is composed of individuals, … the least important of whom may chance to delay things or somehow make them go wrong....This tremendous friction, which cannot, as in mechanics, be reduced to a few points, is everywhere in contact with chance, and brings about effects that cannot be measured, just because

they are largely due to chance.(*On War*, Howard & Paret ed, 1984 pp119-120)"

Clausewitz believed that fog and friction were ubiquitous factors that illuminated a fundamental truth about the nature of war. From general to soldier, the elements of fog and friction have always played a central role in dictating the success or failure of units in combat. According to Owens, this was true until now. Owens describes a system of systems that provides the military commander with an unprecedented ability to see, tell and act. The information-technology-based system of system that is available today can allow the commander the ability to first see and comprehend (dominant battlespace knowledge) all militarily relevant information contained within an area 200 miles by 200 miles, the size of Iraq or Korea . Next, he will be able to transmit his orders (near-perfect mission assignment) in near-real-time, enabling him to direct the employment of both precision maneuver and precision fires assets at such a pace that he will be able to act within the enemy's decision cycle. Lastly, he will be provided with high-resolution feedback (immediate /complete battlefield assessment) which speeds his next decision cycle.

> I believe the computer revolution, if correctly applied, presents us with the unique opportunity to transform the US military into a lethal, effective and efficient armed force that will serve the United States in the twenty-first century. This is the American Revolution in military affairs. (Owens, 2001, p.15)

Owens goes beyond the fact that there is a unique American RMA and postulates that our technology has changed the fundamental nature of war, when he states: " This new revolution challenges the hoary dictums about the fog and friction of war, and all the tactics, operational concepts and doctrines pertaining to them" (2001, p.15). Granted, one may conjecture that Owens' reasoning for this bold view that the nature of warfare has changed due to advances in technology could be solely designed to elicit a strong response from his audience, in effect throwing down the gauntlet for renewed debate concerning the path of transformation. However, if this is his purpose, he does not sufficiently clarify that this point of view is simply an intellectual tool, as opposed to a personally held belief based on his experiences and knowledge about the nature of war.

C.   OWENS OUTLINE FOR CHANGE

First, Owens presents the argument that US is in the midst of an RMA. Second, he outlines the reasons for this revolution. Third, he defines a direction that the US military must move to fully realize the potential of this technological revolution. For Owens, technology is empowering transformation, but he believes that the US is still stuck in a structural paradigm that is hindering such transformation. For the US to realize the promise of our systems of systems that we now have at our disposal, we have to fundamentally change structures within DoD to create real joint operational forces, and move away from the parochial individual service structures that we maintain today. He bases this point of view on a hard look at our military effectiveness in "Desert Storm" in Iraq, and "Allied Force" in Kosovo, in the light of what he terms "military service unilateralism"(Owens, 2001, pp.151-156). This idea is the inability of the services to function efficiently and effectively as part of a joint (inter-service) warfighting entity, exemplified by numerous interoperability issues at best and continuing incidents of fratricide at worst that have plagued military operations throughout the history of warfare. Lessons learned from Operation Desert Storm point out just how un-joint the US military really was. Eight years later, operations in Kosovo exemplified just how little the US military had moved toward true joint operations, even though we had clearly adopted a joint operation concept of warfighting as early as 1991 in Joint Pub 1: *Joint Warfare of the US Armed Forces*, which states:

> The nature of modern warfare demands that we fight as a team… Joint force commanders choose the capabilities they need from the air, land, space and special operations forces at their disposal. The resulting team provides Joint force commanders the ability to apply overwhelming force from different dimensions and directions to shock, disrupt, and defeat opponents. Effectively integrated joint forces expose no weak points or seams to enemy action, while they rapidly and efficiently find and attack enemy weak points. **Joint warfare is essential to victory.** (Joint Pub 1: *Joint Warfare of the US Armed Forces* (Feb 1991 (revised Jan 1995)

Clearly, the idea of a fully joint enterprise is fundamental to America's concept of warfighting, with an all-services mix that intrinsically creates overwhelming force. Owens shows that in practice, this ideal of Jointness was very far from the truth, exemplified by the inability of US Army's Task Force Hawk to integrate effectively with

the US Air Force's air campaign strategy to stop Serb aggression in Kosovo (Owens, 2001, pp196-200). In response to this observation, he delineated his path to realizing the potential of the RMA through the creation of a true joint operational structure and culture within the military. Owens' basic outline for a reinvigorated and modernized US military consists of **Unified command structure, Unitary military war-fighting organizations, Embedded information warfare capability, Shift to Command network, Lean & Mean combat units, C4ISR capability, Consolidated- mobility, logistics, medical service, Homeland support, Cultural harmony** (2001, pp203-206).

He envisioned a future military where a joint committee reporting directly to the secretary of defense would decide service priorities and goals for weapons, research and procurement. The basic building block of military force would be a general purpose *standing joint force* of 15,000- 50,000 personnel, commanded by a 3-star flag officer, that would be located and trained together full time and, therefore, deploy together. These joint forces would have information warfare and advance C4ISR capability that would link sensor to decision maker to shooter. It would facilitate a shift from an industrial hierarchy "chain of command", to a distributed "command network" that could respond faster and more precisely to directives from commanders. Consolidating and streamlining all the individual services' redundant assets under joint organizations, which would provide for the warfighting enterprise, would realize efficiency in the realms of logistics, medical service, and global mobility. Finally, though services would keep their historical identities, their training, education and doctrine would solidify under the rubric of "jointness", leading to military cultural harmony. Owens sees this as the path to real change that at its heart will liberate us from the historical constraints and will safeguard our nation's existence well into this century.

But what is Owens really arguing for? Has technology really changed the nature of warfare? Or does this system-of-systems approach and striving for total jointness simply make us better at a style of warfare at which we are already proficient.

D.   WHAT IS OWENS REALLY ARGUING FOR?

I would agree that at the heart of warfighting is the need for jointness. It embodies organizational structures that maintain the inherent ability to create an organic mix of capabilities, which if utilized correctly places an opponent on the horns of a dilemma-- much like early concepts of combined arms formations (Napoleonic division or blitzkrieg battle groups). Joint capabilities enable a commander to elevate his conceptual warfighting approach from attrition-warfare to maneuver-warfare.   I do not debate the fact that we are in the midst of an RMA, but rather I contend that the approach that Owens espoused for transformation is fundamentally flawed, because it does not adequately address the problems due to the true nature of war: uncertainty, friction filled, and nonlinear. These do not change.   His vehicle for change, which I label "big jointness", is focused on simply making the military more efficient at what it already does. "Big jointness" is an inward-looking approach that is built on the notion that our system of systems has simply not been optimized because we lack the ability to work together due to our single-service focus. Owens argues that if we change our organizational structure at the operational and strategic level, we would be able to maximize efficiencies and effectiveness, ultimately transforming the US military. His 15,000-50,000 troop-sized joint organizations are very close to existing Army division and Corps formations, except the mix of forces would be different. His creation of a harmonious joint culture would produce one theory of victory that would be ingrained throughout the military at every level. His system of systems places the commander at the center of all decision-making and facilitates his personal direction of the joint operation. Owens only pays lip service to the complex and dynamic environment that characterizes war in his discussions.   His expanded premise that technology has the ability to "lift the fog of war" totally discounts the central role of the human dimension of warfare. Equally troubling, if not more so, is his preoccupation with the enabling technology, and his striving for efficiency through large, centralized structural changes that basically misinterpret the causal link between combat effectiveness and increased organizational efficiencies

E. PROBLEMS WITH OWENS' APPROACH.

According to Gregory Wilcox in his <u>article</u> on transformation in *Spirit, Blood, and Treasure*, (2001) the US military moving into the 21st century is ultimately still an attrition- based force that needs to fully embrace maneuver warfare as more than a doctrine but as basic way to approach all aspects of warfare (Vandergriff, 2001). For the sake of argument, if we believe that both of these authors are correct in their observations pertaining to US military forces, Owens' vision could result in the US military just being better at attrition-style warfare, arguably something at which we are already very adept. But more importantly Owens' recommendation leads to a myriad of problems which he just does not address. Military historian Williamson Murray, who has written extensively on the nature of transformation and military innovation, is an ardent opponent of the technological system-of-systems view. He believes that military revolutions have limits. "They (RMAs) have not changed in the past - and cannot change in the future - war's underlying nature"(Knox & Murray, 2001, p.178). To Murray, the view that information technologies will "purge the conduct of war of the uncertainties and ambiguities" and in essence create frictionless war is absurd. For Murray "friction, uncertainty, and confusion in warfare are not superficial annoyances to be gradually eliminated by technological "progress." War is inherently nonlinear. It is the collision of two living wills. And as Clausewitz suggests, no other human activity is so "continuously or universally bound up with chance".(2001, p178)

Owens' map for military transformation is only one path that America could take, but there are alternative and less traveled roads that could hold more promise. Authors Arquilla and Ronfeldt illuminate another approach of an operational concept of "swarming" where "small distributed forces " capable of conducting omnidirectional attacks are the "building blocks" that can capitalize on moves toward networked organizational forms. (Arquilla & Ronfeldt, 2000) The Joint Forces Command (JFCOM) has also produce the concept of Rapid Decisive Operations (RDO) in a attempt to update the way in which the US military will fight. At the heart of all of theses approaches is conceptually how one views the nature of warfare. They all contend with what I believe is a inherent tension between synchronization and agility. In chapter III, I will outline

this problem and discuss an alternative way of conceptually approaching warfare that should help illuminate a more productive path for transformation.

III.   COMPETING PARADIGMS

A.   CURRENT SYNCHRONIZATION-CENTERED OPERATIONS

Owens' plan for change deals with all the services. I will focus on the US Army. I believe that it is true today, as was pointed out by Douglas A. Macgregor, that coin of the realm in conflict remains combat provided by land forces (Macgregor,1997). In addition, even Navy Rear Admiral J.C. Wylie noted, "The ultimate determinant in war is the man on the scene with a gun"(as cited by Gray, 1996). If we truly want to compel an enemy to do what we want, it is accomplished by the application of force by ground units.

Some air power advocates are beginning to disagree with this idea; they usually point to the successes in Desert Storm, Bosnia, and Kosovo as evidence that air power has transcended early limitations and is just as effective at ground power in the role of compelling the enemy. If one closely looks at those cases the real effectiveness of airpower as a unilateral tool comes into question (Pape, 1996). Extreme airpower advocates in particular cite Kosovo as a case of virtual unilateral success. The actual fact is that the threat of ground force, posed both by TF Hawk (a mechanized brigade's worth of combat power) and the irregular Kosovo Liberation Army (KLA), played a part in the calculation made by the Serbs to given into NATO demands. The argument thus is not about airpower alone, but rather how a different vision of ground force might be effective in conjunction with airpower.

I do not question the strategic, operational, tactical utility and even "necessity" of air power for success, but it is almost never an end in itself. Fundamental to success in armed conflict is the use of the type of force that the enemy views as a legitimate threat. Thus, strategic bombardment alone will never supplant the need for ground forces. As Mao Tse-tung stated "Political power grows out of the barrel of a gun," and this statement has never been truer than today given the nature of ethnic and religious based warfare. At the same time, we can't accept this as a justification for a Fulda Gap approach to ground forces. If we are to transform land power effectively, the issue then becomes tied to how we view the nature of military operations. There are two main views of combat; one in which we picture warfare as system that we can control, and the other as a system

that we effect but cannot fully control, much like Herman Melville's idea of the uncontrollable force of nature represented by the white whale in *Moby Dick*.

There has been much written on the direction that war, and conflict in general, is moving - Toffler's third wave, 4th generation warfare. Will the emerging role of non- or sub-state actors, in the future challenge the nation-state monopoly over the use of force. Despite our preconceptions, this monopoly has not existed at various points in the past such as when pirates, privateers and filibusters also advanced their goals through violence (Thompson, 1994). The trend by rogue nations, terrorists, and non-state actors toward using irregular force as a method to further their individual or group goals, is indicated if one graphs conflict since WWII. Dr. John Arquilla, in his classes at the Naval Postgraduate School, illustrates the direction that warfare is headed by using a two by two matrix, where intensity is plotted on the y axis (low to high) and conventionality is plotted on the x axis (irregular to conventional) Figure 1 (personal communications, Arquilla, 2001). This diagram points out that warfare seems to be migrating steadily from the conventional high intensity to the irregular low intensity. Recent events are more troubling with a perceived shift to irregular high intensity. In fact, our worst-case scenario of terrorists or rogue nations using a weapon of mass destruction (WMD) seems increasingly likely. Also of importance is the fact that the type of warfare that the US is historically the best at (high intensity / conventional), is much less likely and possibly less relevant. As warfare theorists explain, this is somewhat due to the fact that the United States is so dominant in this upper right hand quadrant that it has forced our enemies to fight in more irregular ways. The new millennium has ushered in what seems to be a shift up in the intensity scale. Whether this trend will continue remains to be seen, but if last 8 months are any indication, the new century will be a very dangerous place indeed.

This direction in conflict does not clearly delineate the direction we should take for transformation, but rather points out that the operational concept that we choose must be able to survive and be successful in all four quadrants. The alternative is to maintain forces especially suited to one quadrant or another-- a very costly, inefficient approach. The question is what are the controlling factors of army operations and how effective are they within this changing nature of warfare.

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High Intensity

•WWII

•WWI

•Korea

•Vietnam   •Gulf

Irregular   Conventional

•Afghanistan
•9/11 Attack   •Chechnya

•Intifadah II   •Kosovo
2000-

•El Salvador

•Intifadah
1987-93
•EZLN

Low Intensity
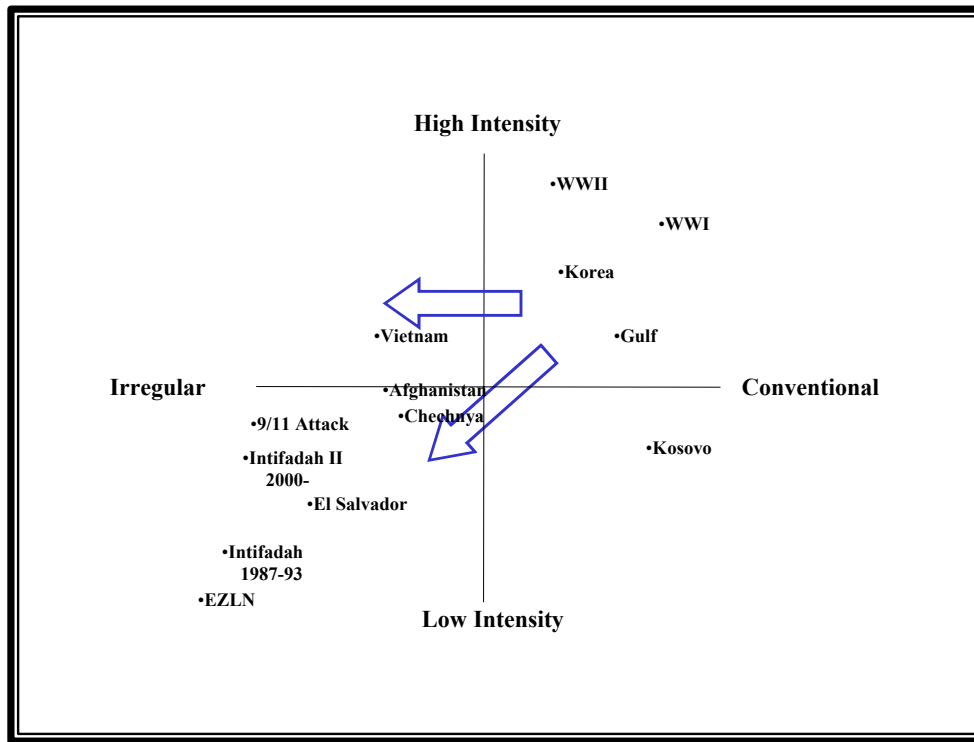
Figure 1.   Migration of Conflict

Field Manual 3-0 Operations (2001) is the US Army's overarching doctrinal manual that lays out its operational concept. It is meant to be an all-encompassing work that provides a guide of doctrinal concepts and their interrelationships that affect how the Army conducts Full Spectrum Operations, which range from support and stability through traditional offense and defense. Chapter 4 of FM 3-0 is devoted to laying out the bedrock foundation on which full spectrum operations rely and drives how they fight war. It outlines the ideas of combat power, the principles of war, and the Army's tenets of operations. All of these factors are interrelated and produce a complex network of concepts that a commander needs to keep in mind concerning operations. Of these core concepts, the tenets of Army operations expand on the principles of war and define the concept that the institution believes characterizes successful operations. According to the text, "they (tenets) are essential to victory. While they do not guarantee success, their

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absence risks failure"(2001, p 4-15) Thus for an officer to fully command the art of war he must be able to balance these competing tenets to ensure success.

According to FM-3 *Operations* manual for the US Army, the Tenets of Army Operations are:

> **Initiative** is setting or dictating the terms of action throughout the battle or operation.
>
> **Agility** is the ability to move and adjust quickly and easily.
>
> **Depth** is the extension of operations in time, space, and resources.
>
> **Synchronization** is arranging activities in time, space, and purpose to mass maximum relative combat power at a decisive place and time.
>
> **Versatility** is the ability of Army forces to meet the global, diverse mission requirements of full spectrum operations. (2001, pp 4-15-18)

Intellectually, we can understand how these tenets fit together, and that it is how they are mixed, ordered, and emphasized that results in victory, but in practical terms the tenet of synchronization usually become the nexus of operations. It is the unifying tenet that is preached, even though the manual specifically point out that there is inherent tension to do with synchronization when it states " Synchronization is a means, not an end. Commanders balance synchronization against agility and initiative; they never surrender the initiative or miss a decisive opportunity for the sake of synchronization"(2001, p 4-16) Figure 2 outlines what I believe is the current paradigm of "sync-centric" operational concept. Without synchronization, our highly complex and technologically advanced force will not mass effects for the commander at the decisive time or location on the battlefield. Synchronization's primary product is maximizing efficiency of all the functional sub components of the combined arms organization, or what the doctrine terms the battlefield operating systems (BOS). We only become agile if all of the sub components of battle are centrally directed and orchestrated, thus creating a fully integrated system of systems that can react as unified complex system. The goal of this synchronized force is to produce a high reliability force that is dominant in peace

and decisive in war. However, there is a hidden problem that synchronization does not address, which is its vulnerability to the fog and friction of war.
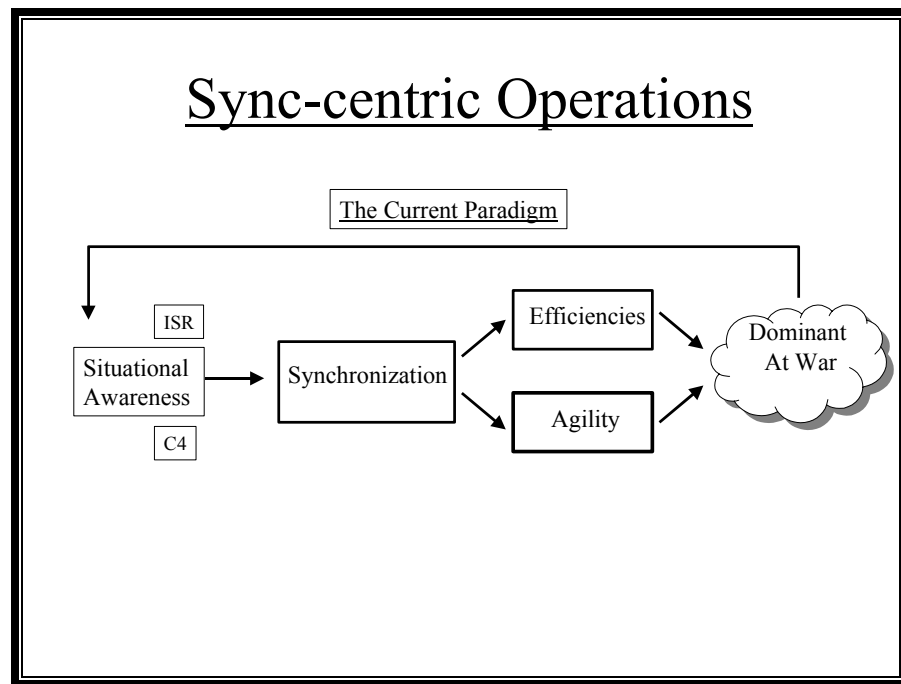
Figure 2.   Sync-Centric Concept

At this juncture it is important to review of the nature of complex systems. Charles Perrow developed his theory of "normal accidents" in 1984. Basically it tried to understand why accidents happen within high-risk, complex systems, organizations, or processes like space flight or nuclear power plant operation, and if they are avoidable. He posited that accidents have to do with how the failures within the system interact, the "interactive complexity" of the system (either linear or complex). It also focuses on how dependent parts of the system are on each other, which determines whether they are tightly or loosely coupled Figure 3 (1984, p. 97). His conclusion was that if a system's characteristic was complex interactions and tight coupling of dependent parts, the result was a system that will inevitably produce a "normal accident". Because of the high-risk nature of the system, the result is catastrophic failure (1984, pp. 62-100).

The problem, as he views it, is that there are factors within the system that are working at counter purposes to each other. This conflict arises from the organizational concepts of centralization vs. decentralization of authority relevant to crisis (1984, pp. 332). A system in which interactions are complex demands decentralization to cope with

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unplanned interactions of failure. A system of the tightly-coupled dependency of parts requires centralization to insure immediate response, because there is no slack built into the system. If one minor part fails there is no room to isolate that failure, causing a cascade of failures that, once started, can result in total system failure (1984, p334). A system that has both of these properties will eventually suffer a normal accident. Applied to space flight we lose the Challenger and all the crew on board because of an O-ring failure. If we make the argument that our military organizations and operations are complex tightly-coupled systems, a resulting normal accident (which is unavoidable) could cause massive loss of life as well as political repercussions and fundamental challenge to our national security.
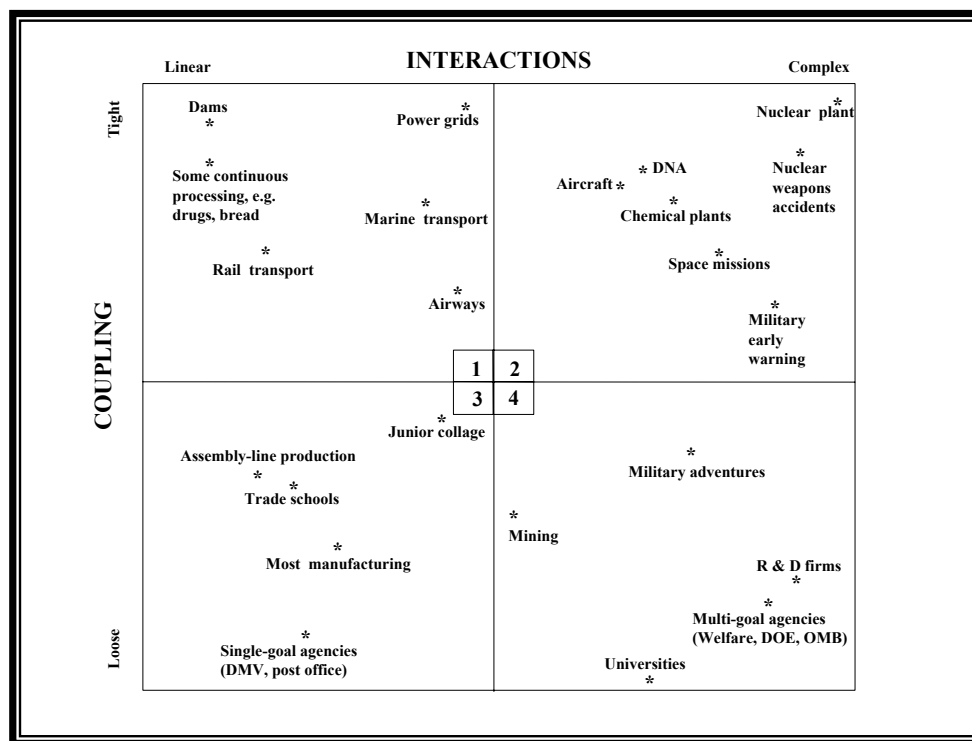

Figure 3.   Perrow's Interaction /Coupling Chart

Expanding on Perrow's theory of normal accidents, Chris Demchak looks at the impact of high complexity systems on the organization in her book *Military*

Organizations, Complex Machines. (1991). Her thesis is based on a case study of the introduction of the M1 tank (a highly complex system) and points out the unintended problems that adversely affect military organizations when they adopt complex high technology systems. As she states:

> Complexity in critical machines induces increased organizational complexity in constrained organizations (US Army), a process that is a result of various kinds of unknown and unpredictable outcomes in complex systems. Scarcity of knowledge, inherent in complex systems, induces positive feedback cycle in which managers attempt to reduce the uncertainties of the new machine increase organizational uncertainty. Second, a more complex military organization will have proportionally greater problems in trying to operate effectively in wartime. The more complex organizational relationships distort knowledge identification and transfer mechanisms. Outcomes are therefore not only unpredictable but also likely to be highly undesirable.(1991, pp 11-12)

A weapon system is only one part of the warfighting enterprise, and Demchak does a thorough job pointing out the cascading implications and effects that one system had on an organization, doctrine, logistics, decision makers, soldiers and even culture. Her case study only explores one aspect of complexity within an organization. If we agree that as systems complexity goes up, the need to control surprise (unforeseen and unpredictable outcomes) increases. As more and more complex systems are added, surprise and the need to control it increases. We can quickly see the possibility that military operations can move into Perrow's normal accident space (quadrant 2 of figure 3), creating a system that is truly unreliable. Owens' system of systems begins to look more fragile in this light.

Both Perrow and Demchak's ideas undermine synchronization as a unifying operational tenet. As our warfighting structure gets increasingly complex, and because of synchronization more tightly coupled, our structures could be less effective and less reliable in actual combat, where the organizations are subject to the full range of inputs of uncertainty and friction both from internal and external sources. Where Owens believes that the technology could negate the effects of friction, Perrow and Demchak suggest that the complex, synchronized system of systems leads to a less effective and reliable force. The complex interrelationships of warfare appears to be at the heart of this problem, and no one approach seems to holistically address all the nuances of the problem, which faces

an organization that has to not only survive but excel in such a complex dynamic and adaptive environment. Simply put, transformation must include the exploration of different approaches to deal with this problem.

B.   ALTERNATIVE- EMBRACING CHAOS

The spark that started me in the direction of a conceptual framework based on Chaos was a conversation that I had with my boss, LTC Beech, at JRTC. He briefly outlined his view of the fundamental nature of operations by drawing the graph (figure 4.)

Nature of Operations
Chaos Concept

High

Enemy

Level of Chaos

new info

Progress of Military operation

mistakes

weather

combat   Friendly

Low   We try
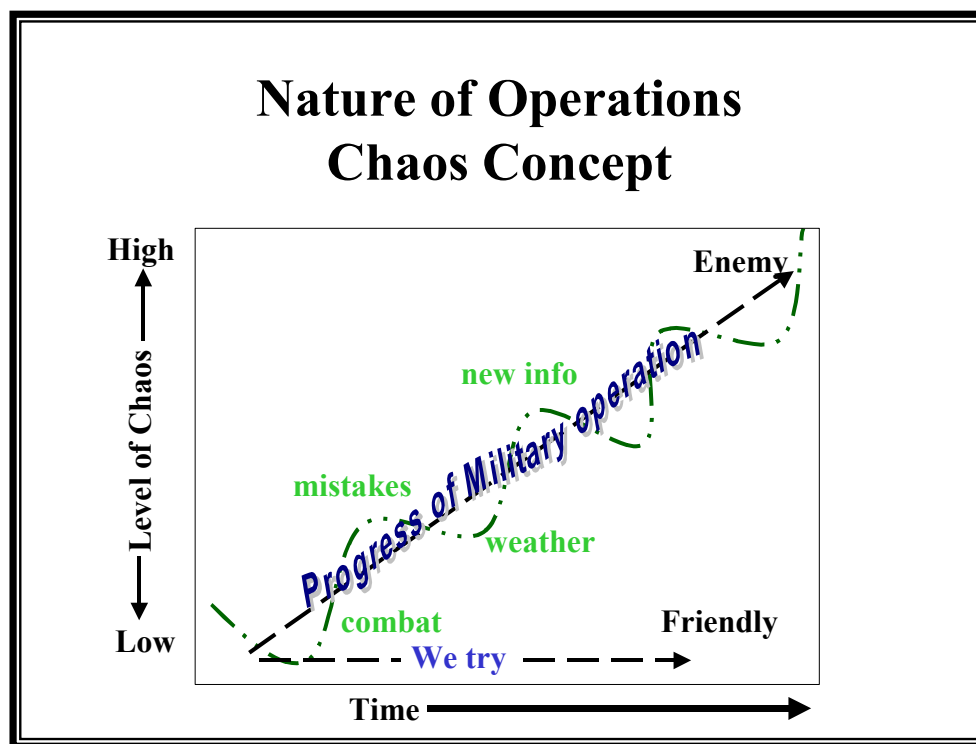
Time

Figure 4.   Chaos Concept

In it, he outlined a conceptual model of the nature of operations. At the start of the operation the overall level of chaos and friction were low, but as time and events progressed that level of chaos went up until the point at which one side was destroyed, defeated, or retreated. Along the continuum of the progress of the operation was a notion that the enemy and friendly forces, as well as the friction of chance, tried to control their own level of chaos. They did this through multiple tools, plans, orders, synchronization

matrixes, decision support templates, indirect fires matrices, R&S matrices. These were all tools to deal with the inherently chaotic nature of combat, and focused on retaining the initiative and flexibility but reducing as much of their own chaos as possible. It was his belief (really along the line of true maneuver theory) that instead of trying to focus all our efforts on trying to reduce internal friction, we should in fact focus on developing tactics, plans and strategies that inflict the greatest amount of chaos on the enemy. In essence, embracing the chaos of battle as a combat multiplier and exploit its opportunity for success. But the figure suggests that friendly forces don't embrace chaos-- rather it says they attempt to control or suppress it. Conversely, we should spend less time trying to control something that at the base of it is uncontrollable. He didn't renounce synchronization as a means to mass effects, but emphasized the idea of that over-reliance on syncing everything on the battlefield leads to an inward looking approach to warfighting that is not focused enough on out thinking the enemy.

C.   CHAOS AND THE NATURE OF WARFARE

The study of classic military theories is central to the development of US military doctrine, as well as educating our officers on how to think about the nature of war. By studying Sun Tzu, Clausewitz, and Jomini we can begin to see recurring themes that lead to the basic principles that each theorist believed applied to war. In his seminal article, Alan D. Beyerchen (1992) applied the concept of nonlinearity as a means to understand the ideas of Clausewitz and the nature of war. This coupling of old theory and the new science of complexity and chaotic systems seem to not only update and validate Clausewitz's theories on friction and unpredictability of warfare, but also to call into question the validity of reductionist, and linear analysis approaches to defining the nature of war as insufficient and incomplete. Beyerchen sums it up when he states:

> War seen as a nonlinear phenomenon -as Clausewitz sees it- is inherently unpredictable by analytic means. Chance and complexity dominate simplicity in the real world. Thus no two wars are ever the same. No war is guaranteed to stay structurally stable. No theory can provide the analytical short cuts necessary to skip ahead of running actual war. No realistic assumptions offer a way to bypass the uncomfortable truths. Yet these truths have the virtue that they help us identify the blinders we impose on our thinking when we attempt to linearize. And what Clausewitz says about the conduct of war applies to the study of war:

"once barriers- which in a sense consist only in man's ignorance of what is possible- are torn down, they are not so easily set up again."(as cited by Cezerwinski, 1998, p206)

By applying the concept of chaos and complexity theory to the study of warfare, the door is opened to possible application of a new set of principles to warfare that could be used as not only organizational and technical design factors, but as conceptual doctrine which would drive our warfighting doctrine. In their article "What does chaos theory mean for warfare? Maj David Nicholls and Maj Todor Tagarev show how and why the application of chaotic principles is relevant to the development of a theory of war. Chaos theory provides an analytical tool to describe natural phenomena, which appear random and unpredictable, but upon closer examination prove to be deterministic systems. These systems are subject to different sets of laws that actually account for some level of predictability. If we look at historical theories of war by Sun Tzu, Jomini and Clausewitz, it can be concluded that warfare has all the properties of a chaotic system. Most hard applications of chaos theory are in the development of computer models that replicate complex dynamic systems like weather models or modeling fluid dynamics. However, if we broadly apply the concept of chaos theory to warfare, not as a mathematical tool to produce a simulation, but rather as a conceptual tool to better explain its basic nature and the way that it reacts, it should help us to better develop doctrine, organization and technology to deal with it. The key ideas that we can derive about warfare at all levels are the following ideas.

1.   **Nonlinear**

Warfare is a nonlinear system. This means that small efforts can have a disproportionate effect, and conversely large efforts can have very little effect (Nicholls & Tagarev, 1994).   Sources of nonlinearity in warfare are numerous, including complexity and numbers of interrelated processes, the psychology of interpreting enemy actions, and the effects of Clausewitzian Friction (Beyerchen, 1992). This concept accounts for the importance of the intangible effects of leadership in war, as well as the fact that the application of massive amounts of fire power often does not result in the desired effect. Effects Based Targeting (EBO) and Center of Gravity (COG) are based on this concept. Nonlinearity dictates that it is more important to attack processes in an enemy system rather than focusing on data about its current condition (Nicholls &

Tagarev, 1994). It is incumbent on officers to fully exploit this inherent property of war, while understanding its impact on our operational concepts

2.   Fractal

This idea says that elements within a chaotic system are infinity complex. It is therefore very difficult to break the system into easily analyzable pieces- trying to figure out the enemy's system is in one respect impossible because there is always a finer level to analyze. However, because of this fractal nature, behaviors throughout all the levels of war are linked, therefore a technique that is successful at one level should be effective at all levels. Most military doctrines exploit this nature through the development of principles that can be applied to all levels of war. "(Fractal nature) suggests that we should try out strategies on a small scale when the consequences of losing are inconsequential" (Nicholls & Tagarev, 1994). Fractal nature also points out weakness derived from understanding the psychology of an enemy commander, that how he deals with small problems e.g., strategies in playing chess or cards, is likely to provide critical insight into how he fights on the battlefield.

3.   Multiple Quasi-stable States

This principle means that within warfare, many different states can co-exist, and the transition between states can be very rapid. This challenges the idea that there is a clear line of demarcation between support and stability operations, and warfighting. Transition between irregular and conventional methods of war can take place very rapidly, and even when a transition has taken place, the enemy's can shift back and forth in his own best interest to defeat a friendly strategy. Marine Corps General Charles C. Krulak's concept of the "Three Block War" succinctly captures the concept of multiple quasi-stable states, "One moment they will be feeding refugees and providing other humanitarian relief. A few hours later (conducting peace keeping operations) Marines will be separating fighting warlords and their followers . . . Later that day, they may well be engaged in mid-intensity, highly lethal conflict -- and all this will take place within three city blocks. We've already seen evidence of this in Somalia -- and there will be many future Somalia's"(1998). The implications of this are that our forces must have the ability to freely transition between states, either to react to an enemy strategy or as a part of our own strategy to overwhelm a possible enemy.

4.   Sensitive to Initial Conditions

"Chaotic systems never repeat because their future behavior is extremely sensitive to initial conditions"(Nicholls & Tagarev, 1994).   The result of this is that very small changes in an initial condition will eventually cause large changes in the system. As we have discussed earlier, it is very difficult to determine which factor or set of factors is the root cause for this nonlinear result. This fact accounts for the unpredictability of war, but simultaneously this unpredictability stays within certain bounds, and understanding those bounds helps us cope with this fundamental fact. This sensitivity to initial conditions points to the importance of getting to the scene of conflict early so that you can affect initial conditions. This will tenet will require certain balance of strategic and operational mobility, as well as a less adverse risk approach to military operations. In the future, as observed in the past by Nathan Bedford Forrest when he said " I can always make it rule to get there first with the most men" Conceptually Forrest's idea is as applicable for the future as it was in the past.

Before concluding, it should be understood that chaos theory in itself is not a total theory of war.   It simply illuminates a way of evaluating all kinds of systems, organizational, technical or doctrinal, to determine just how effective they would be within the context of the chaotic environment of war. I believe that the historical operational principles and tenets continue to be applicable. However, we must consider the way in which we order, prioritize and integrate them, so that we can address the tension between synchronization and agility. Synchronization is far from dead; it simply needs to be moved from the superior to a subordinate position within our operational concepts. Another danger pointed out by Maj. Susan E. Durham, Ph.D. is the that fact there are limits to how far or even if chaos theory should or could be applied to the "soft sciences"

> Chaos Theory is a mathematics-based description of how real, physical systems behave. We cannot expect this theory to apply to situations that are driven by random, or similarly stochastic conditions. If human factors such as free will aren't stochastic, we might be able to apply Chaos Theory to societal situations. But, if free will is stochastic, then it might

make no sense to apply mathematical predictions based on deterministic Chaos to such systems.(Durham, 1997,pp 41-42)

She applies the tenets of Chaos to evaluate the concept of COGs and "parallel attack" using Warden's Five Ring Model. She concludes that this system is metaphorical Chaotic but is not chaotic from a purely mathematical point of view. This illustrates that "*except* in the case of physical or mathematical systems, applying the definition of Chaos to societal situations is often a matter of assumptions, judgments and opinions"(Durham, 1997, p 50).

D.   CONCLUSION

Using the tenets of chaos: nonlinearity, fractal, multiple quasi-stable states, and sensitive to initial conditions illuminates not only the nature of the warfighting environment but also provides a yardstick for real effectiveness in the evaluation of Organization, Technology and Doctrines for US military units. If we want to actually optimize the effectiveness for real warfare, these tenets of chaos outline what I believe is an alternative to our current model. All military services have embarked on transformation. Its priority is so high that the latest Unified Command Plan has directed that the USJFCOM be placed in charge of our national efforts to transform the military following the four main concepts outlined in Joint Vision 2020. These are Dominant Maneuver, Precision Engagement, Focused Logistics, and Full Dimensional Protection. However, fundamentally different services have different views of transformation. The Navy has pushed "network centric warfare" as a key concept primarily based on its operational environment, and its unique perspective on warfare. Blindly applying NCW concept to the land forces and believing that it will transform us glosses underestimates a host of new problems that its brings. Primarily, the increase systems complexity and related reliability issues induced by a friction rich operational environment that characterizes land warfare. Although Cebrowski's concept of self-synchronization is a goal of NCW, we must question whether achieving this goal is merely an issue of increasing technology, or whether it will require changes in doctrine, training, and organization.
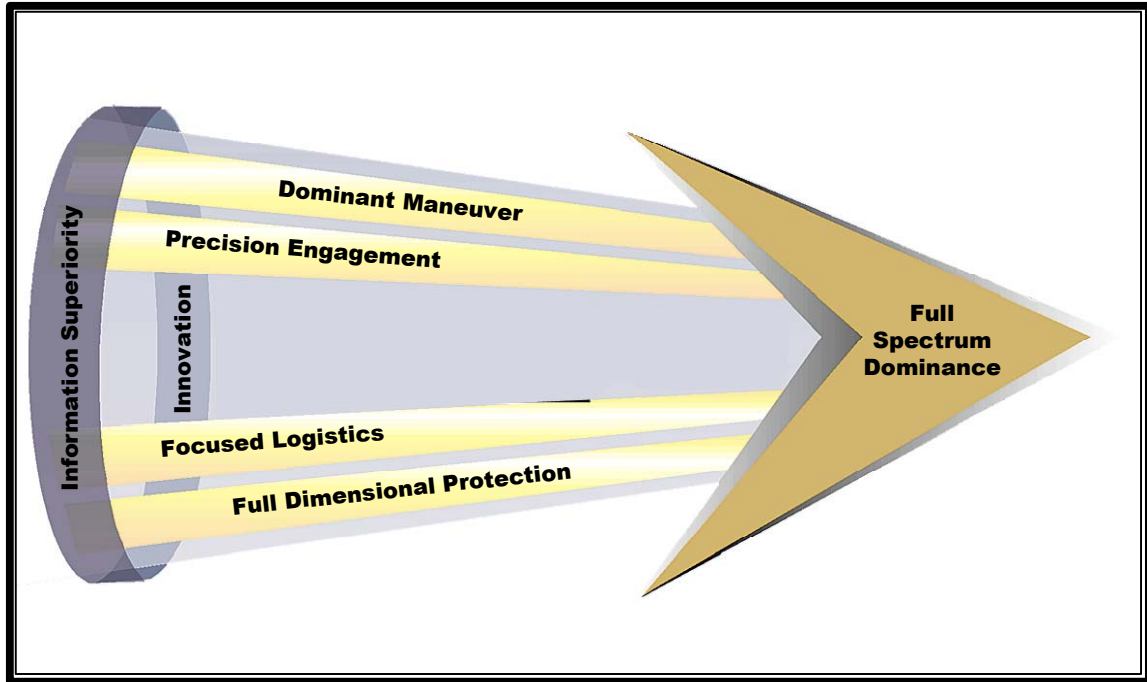
Figure 5.   JV2020 Conceptual Vision [1]

More importantly, the path to this goal requires different approaches from service to service. What works for a 12-ship carrier battle group does not necessarily cleanly transfer to a brigade combat team (BCT) that has around 35-40 company size maneuver units not to mention the tracking of over a 1000 battlefield entities (combat, combat support, and service support vehicle) as well as over 5000 soldiers that populate the battlespace.

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[1] This graphic copied from JV2020 (2000), p 2

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IV. ORGANIZATIONAL DIMENSIONS

A.   INTRODUCTION

As outlined in Chapter III, there is a very good argument that warfare exhibits the characteristics of a chaotic system. One can therefore categorize war as a complex and dynamic environment. As a jumping off point in the discussion about the organizational aspects of transformation of Army combat forces, we need to understand that the input into the environment (warfare) is the output of the combat organization. We should interpret the environment in which we want an army unit to maximize its full potential as encompassing a range of environmental conditions that vary in relation to aspects of change and complexity. The result is an environment that can fluctuate dramatically from one phase state (quasi-stable states) to another, depending on many different inputs from a complex set of sources, most notably from the combat unit. By studying organizational theory, one may determine some underlying structuring principles that should be taken into consideration when designing organizations. With this in mind, chaos may define the environment in which the organization will be required to perform, and organizational theory provides the underlying conceptual framework to answer the question of how to structure the organization so that it will not only survive, but flourish in this highly dynamic and complex environment.

B.   ORGANIZATIONAL THEORY IMPLICATIONS

In his book *Structure in Fives: Designing Effective Organizations*, organizational theorist Henry Mintzberg (1983) outlines his approach to organizational design. He states that a driving principle for effective structuring is determining the optimum coordinating mechanisms that explain how an organization coordinates it work. According to Mintzberg, these mechanisms are mutual adjustment, direct supervision, standardization of work processes, standardization of work outputs and standardization of worker skill (p 4). Each of these coordination mechanisms achieves the same purpose through different means and techniques. What is revealed by examining these coordination mechanisms is that "As organizational work becomes more complicated, the favored means of coordination seems to shift from mutual adjustment to direct supervision through

standardization of work processes…output…skills, finally reverting back to mutual adjustment"(p 7). As the work becomes more complicated, the outcome is driven back to the most basic and organic coordination mechanism, mutual adjustment.

Along with the five coordinating mechanisms, Mintzberg outlines a set of *situational* and *contingency factors* that influence the effective design of the organization. These factors are grouped into age and size, technical systems, environment, and power (pp 121-149). Though all four have impact on military organizations, his theses about environment, and age & size, have the most relevance concerning transformation. According to Mintzberg's concepts, an organization's design, factors and structure should relate directly to the type of environment in which a giving organization must operate if it wants to remain successful. The following are the primary environmental factors that influence how to design to fit the situation (pp 137-142)

ENVIRONMENTAL Hypotheses

- The more dynamic the environment, the more organic the structure
- The more complex the environment, the more decentralized the structure
- Extreme hostility in its environment drives any organization to centralize its structures temporarily
- Disparities in the environment encourage the organization to decentralize selectively to differentiated work constellations
- The greater the external control of the organization the more centralized and formalized its structure

What do these factors mean to the US military ground forces?

Hypothesis 1: The more dynamic the environment, the more organic the structure

The implications for this factor indicates the need for both organic combined arms combat teams and standing JTFs, versus task forces where brand new mixes of units are stood up and put together as required by each new contingency. This organic structure equates to smaller self-contained units that integrate major combat capabilities (fires, maneuver, intel and logistics) at the lowest level. These standing forces "in being" are

more effective because trust and personal interactions have been forged through habitual and routine teamwork and shared experiences. This allows the unit to adapt to rapid and discontinuous change in the environment.

Hypothesis 2: The more complex the environment, the more decentralized the structure

This second factor indicates that, as environmental complexity increases, there emerges a comprehensibility issue (p139) which plagues decision makers. The fact is, no one commander can fully comprehend or foresee all of the different solutions to the problems on the battlefield. Consider Krulak's "3 Block War" -- where the nature of the situation varies profoundly from one block to the next-- In this complex environment blanket decisions from a centralized authority are unlikely to apply well to each situation or will be so broad as to require extensive analysis and interpretation. In either case, this feedback loop slows down the subunit's ability to accomplish its assigned task. If we are to retain agility and flexibility, not to mention combat effectiveness, commanders have to push power down to lower levels for the organization to remain viable.

Hypothesis 3: Extremely hostile environment drives any organization to centralize its structures temporarily

This factor is simply a re-justification of the primacy of leadership within our doctrinal constructs about combat power. It takes leadership at the decisive point on the battlefield, as environmental hostility increases (casualties and uncertainty increases), to provide that direct supervision (centralization of decision) to overcome that hostility.

Hypothesis 4: Disparities in the environment encourage the organization to decentralize selectively to differentiated work constellations

This means that the organization must also retain the authority and internal flexibility to change its organizational configuration as well as change its work output to deal with a changing environment at all levels. An example of this is the need for multifunctional units that work within commander's intent and guidance, and adapt to the changing requirements of the battlefield. It is also an indicator that different units and or branches require different "rules" regarding ratios of leaders to lead or force protection

rules. Such requirements may on their face of it may violate perceptions of "fairness" or will not fit well into the "system of systems" approach to uniformity. An example of this could be that the capabilities of the future "objective force" will allow for a force structure which could replace light & heavy forces, or traditional roles of infantry and armor.

Hypothesis 5: The greater the external control of the organization the more centralized and formalized its structure

This factor outlines the impact that our civilian government has on the military in the form of holding military commanders accountable. Examples of this are command requirements for fiscal responsibility, perpetuation of policies and actions to avoid casualties at all costs, and a general environment of risk aversion within the military. The result of this external control on military organizations is to further reinforce trends to centralize of power and decision authority at the highest levels.

Because of these environmental factors, Mintzberg concludes that the type of internal coordination mechanisms in an organization correlates directly to environmental stability and environmental complexity. Organizational theory has developed a framework to help us visualize the environment. According to this concept, the environment is divided along two vectors. The first vector focuses on environmental complexity, and ranges from simple to complex. Simple in this context is represented as "a manufacturer who produces simple products with simple knowledge"(p 136). A complex environment is a "space agency that must utilize knowledge from a host of the most complex scientific fields to produce extremely complex outputs"(p136). The second vector focuses on change within the environment and ranges from stable to dynamic, where stable equates to predictable, and dynamic represents unpredictable requirements or input to the environment (p.136)
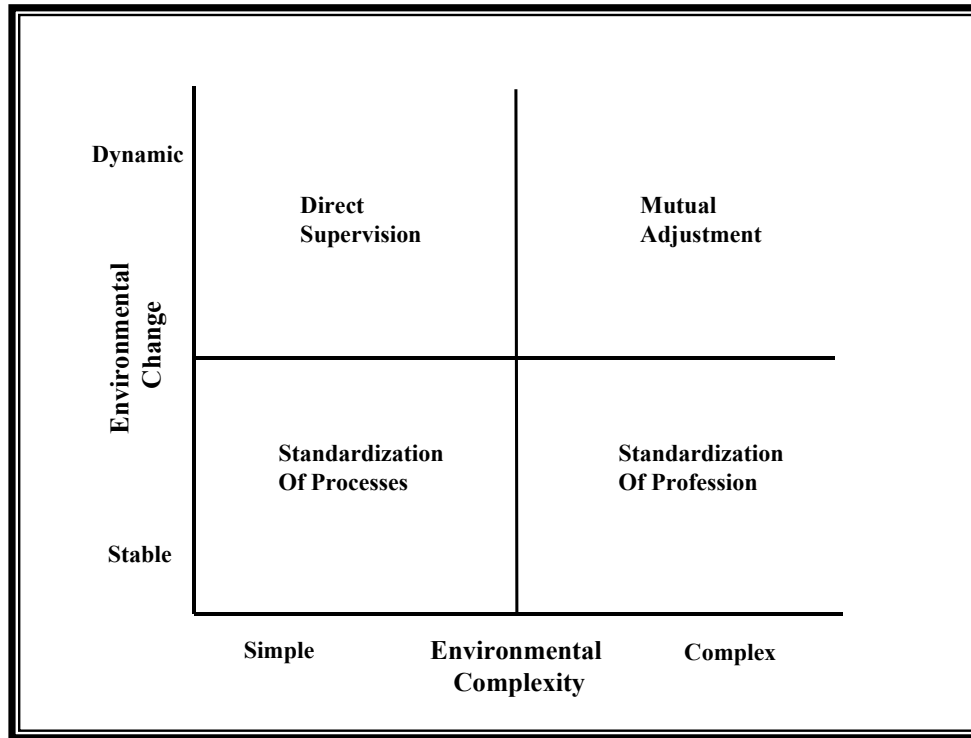
Figure 6.   Coordination Mechanism / Environmental Factors[2]

Mintzberg believes (Figure 6) that as the environment move from stable/simple to stable/complex, the coordination measures between organizational elements moves from standardization of work processed to standardization of skills. In these quadrants, organizations tend to be bureaucratic structures that move from centralization to decentralization of power (p144). Additionally, as the environment changes from dynamic/simple to dynamic/complex, the coordination measures move from direct supervision (centralized power) to mutual adjustment (decentralized power) (pp144-145). In peacetime training environments, army organizations work in stable/simple to stable/complex environments. Once deployed for combat operations, however army organizations operate in dynamic environments, which range from dynamic/simple to dynamic/complex. The answer to the question, which environment should we organize for?, is really related to where we want to optimize our effectiveness. Units that are very effective in wartime are not necessarily efficient in peacetime. If one believes that Mintzberg's ideas are correct, it would seem that there should be an inherent drive to base

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[2] Mintzberg, 1983, p 144

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our combat organizations on a decentralized organic or networked structure if we want to maximize their effectiveness in combat.

The second situational factor of nearly equal importance to how an organization structures itself is the correlation between its size & age. The U.S. Army has existed for 227 years. While greatly reduced from its WWII peak of 14 million soldiers, the one and a half million total force of active and reserve soldiers remains the largest organization in American society today. The age and size factors affecting it are enormous, and result in large obstacles to change that will confound those who seek fundamental organizational modification. According to Mintzberg (pp. 123-126), age and size have several implications.

AGE & SIZE Hypotheses

- The older the organization, the more formalized its behavior

- Structure reflects the age of founding of the industry

- The larger the organization, the more elaborate its structure- that is, the more specialized its tasks, the more differentiated its units, and the more developed its administrative component.

- The larger the organization, the larger the average size of it units.

- The larger the organization, the more formalized the behavior

The result of these factors, as they apply to the Army, is the fact that over time we have evolved into a large highly bureaucratized organizational structure. Mintzberg posits that all organizations have five basic parts. These consist of the strategic apex (the senior officers overall responsible for the organization), the middle line (midlevel management personnel), the operating core (the operators who do the work), the techno structure (the staff focused on improving operations and efficiency through standardization) and the support staff (who provide admin, logistic and maintenance functions to the organization) (p. 9-10). Depending on the configuration and importance of each of these basic parts to the functioning of organization, Mintzberg determines that there are five basic organizational structures; the simple structure, the machine bureaucracy, the professional bureaucracy, the divisional form, and the adhocracy (p. 23). By applying

Mintzberg's five basic organizational structures to the US Army Division, we can see how our combat unit structures relate to his organizational framework (figure 7). Through this application, we find that the army, over time, has organized itself as a machine bureaucracy.
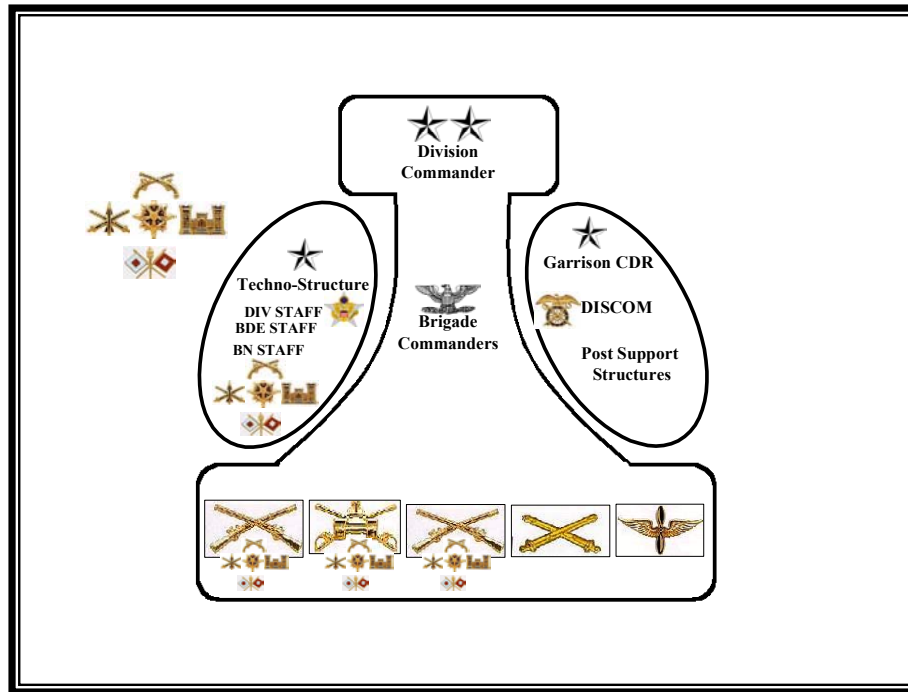
Figure 7.   The Army Division as Mintzberg' Machine Bureaucracy

This structure is effective in maximizing efficiencies within a stable/simple environment, and works relatively well in dynamic/simple environment because of its tendencies to centralization. It is however not, organized for maximum effectiveness in a dynamic/complex environment.

Given what has been outlined, the Army's current combat organizational structure was not created but, rather, has evolved based on a need to operate in man's greatest environment of change: Warfare. Through the ages, warfare has remained a highly complex competition between groups of people. How you organized your forces and capabilities, and how you employed those elements resulted in success or failure. War's other driving characteristic is its finality; mistakes result in death. Therefore, knowledge of warfare and its supporting technologies needed to be retained by all societies. The different branches of the Army reflect this drive to develop and possess various forms of specialized knowledge of warfare. Due to this complexity, the basic tasks were grouped

into what we know today as the Battlefield Operating System (BOS): command and control, maneuver, intelligence, fire support, combat support, mobility-counter-mobility, and air defense. As one can tell, these systems are an amalgamation of capabilities, as well as groupings of specialized functions. Because of this specialization and diversification, it would take years of study and experience to master the employment of all of these capabilities to result in a successful battle or war.

Specialization caused the creation of the branches of the officer corps, which in turn became repositories of the specific art and science for each function. This segmentation also created subcultures within the overall culture of the Army. Organizational culture is widely accepted as a major factor within organization theory (Galbraith, 1995, Bolman and Deal, 1997), affecting how an organization structures itself. In the 1930's we adopted permanent division organizations consolidated at large Army posts. This decision was a response in the drive for efficiency, in not only supply and logistics, but also in the ability to train in powerful combined arms organizations. This organization structural was an industrial age reflection of linear mass and attrition-based operational concepts. The unintended consequence of this restructuring and consolidation period was that now we had 15,000 person organizations, which were large enough to support each of these subcultures. The stable/simple peacetime training environment predominated for most of the cold war and extenuated the differences of each respective knowledge subculture, leading to organization differentiation, additional hierarchies, and pressure to bureaucratize.

An example of this phenomenon is the development and creation of the military intelligence branch (MI), which came into existence as "the U.S. Army Intelligence and Security Branch" on 1 July 1962 (Fort Huachuca Museum, 2002). Though MI roots go back to Nathan Hale in the Revolutionary War, its functional issues were not addressed until, "[the] branch was redesigned on 1 July 1967 as the Military Intelligence Branch. It was given a full-fledged combat support role that enhanced its capacity to attract the best Regular Army officers." (Fort Huachuca Museum, 2002) As is evidenced by a study of the division organization charts, the first time we see designated MI units is in the Division Restructuring Survey (DRS) of 1976; prior to that date, Intel was a special functional area in which other branches worked. It is interesting to note that before this

time, Regular branch officers preformed the S-2 function and interfaced with the enlisted intelligence gathering specialties. The apparent intent behind this change was for MI to be a tactical unit to provide direct intelligence to the field commander.

In practice, what was actually created was a new subculture; one with its own career path and reward system. Intelligence was viewed as such a critical and complex specialty that a completely new branch of the officer corps was required. The Military Intelligence officer's function was to provide a new level of professional understanding to a maneuver commander. In reality, MI formed a new culture, one which received its rewards, career-wise, in strategic intelligence assignments, where MI officers viewed their contributions to the Army as more important. The creation of new concentrations of specialized functions to better support the combat arm branches, in execution, created a new branch that now saw itself as equal to, or better than, those that it was designed to support.

Another case of the division structure creating the foundation for fostering a parallel power base is within the artillery branch. During WWI, artillery bombardment took on a new relevance. As technology advanced, artillery was now no longer limited just to providing direct support to the infantry; artillery was hailed as combat power that could be massed against enemy troop concentrations and nearby infrastructures. It could cause such horrific destruction that the enemy would capitulate or surrender. These WWI concepts of firepower pre-date the rise of airpower and strategic bombardment theory. In the past 2 decades we have seen the destructive capability and operational ranges of artillery continue to increase. With this change is also an increased drive to use artillery and missile fire to strike deep at our enemies as high payoff targets present themselves, irrespective of the maneuver plan.

LTC Robert R. Leonhard outlines this trend from classical fire support (artillery fire integrated to support the maneuver element in battle) to, in his terminology, "parallel fires" in which " … Maneuver systems and fires are operating in the same direction and seeking the same goal, but they are not working together" (2001, p 49). As he goes on, he identifies what I believe is at the heart of this incongruity: "there is a profound cultural issue at work here. The artillery officer that has self-actualized with this system of

parallel fires will not desire to return to [the] ignominy of customer support" (p 50). It is my assertion that the DIVARTY structure within the division organization created a subculture that grew until it could create a Mintzbergian "work constellation" that it controlled, and over time this has changed the way we use artillery fire in battle. The question that Leonhard poses is does the army really want or need parallel fires and do parallel fires improve the output of the combat organization? In the terms I have laid out, does this drive to centralize fires in order to maximize artillery's effectiveness have a larger negative implication for combat organizations in an environment that is complex and dynamic?

These two examples show some unintended side effects of the divisional organizational design, the proliferation of branch subcultures, has progressed to a stage where they clearly define the terms of their own use and measures of effectiveness. This trend leads to large organizations, highly differentiated and inevitably bureaucratic. Owens talks about the impact of service parochialism on joint organizations (2000, pp. 52-53, 197-200). It should be noted that in addition to contending with external service parochialisms, the Army has another layer of cultural complexity in the branch parochialism with which it must contend. Mintzberg's age & size hypotheses provide an explanation of the organizational structure that we have, our entrenched subcultures, and the highly formalized behaviors we have created. All of these factors conspire to make it very difficult to change our structures at the fundamental level.

At this point, plotting the major forms of warfare/conflict on the environmental factors chart offers some insight into the optimization and fit of our current unit design. One way to visualize this construct is through the ways in which the Army operates: peacetime training, linear (attrition based) warfare, nonlinear warfare (pure maneuver theory/EBO/swarming), and finally support and stability operations (human centric-peace keeping /peace enforcement, currently referred to with the acronym SASO).
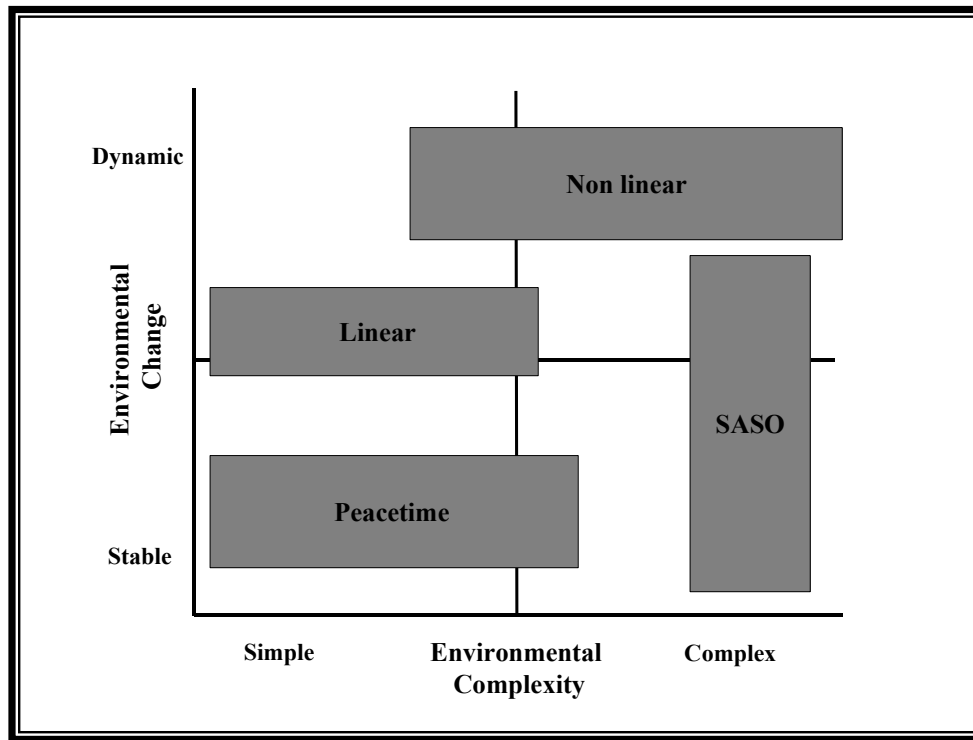
Figure 8.   Operational Concepts applied to Environmental Framework

     Our military units are currently organized to be successful in a peacetime environment (stable /simple). Peacetime fiscal constraints require high degrees of efficiency leading to bureaucratic procedures reflected by our centralized management of training and resources to achieve this goal. In our training, we can virtually control all the input to the environment (except the weather). Consider "lane training", as the Army's situational training exercises are known. The task, the terrain, the OPFOR are all tightly constrained with the goal of focusing on mission critical "METL Tasks" While this is effective in a narrow sense and maximizes resources (e.g. time, ammunition and land) it can also be though of as penny wise & pound foolish. These units achieve far less when placed at one of the training centers (NTC, JRTC), which replicates a far, more complex and dynamic environment.

     The linear style of warfare attempts to maintain a clear boundary between who is friendly and who is the enemy. The "trinitarian warfare" model discussed by Martin Van

Creveld, in his book *The Transformation of War*, views war as something waged by nations, controlled by sovereign governments and fought by field armies on unpopulated battlefields to settle political disputes (1991, pp. 35-42) fits this linear concept of war. The point of Van Creveld's book is that this kind of war is going away in favor of more asymmetrical approaches. Still, the linear, attrition-based battle works best within the current divisional structure, which deals with increasing complexity by creating specialty units to handle all aspects of the environment resulting in simplifying the overall battlefield. In effect, it is an attempt to pull warfare into the dynamic/simple quadrant. We can move from peacetime to warfare with no major changes, as long as we can keep warfare in line with Field Marshal Bernard Montgomery's concept of the "tidy battlefield" (dynamic/simple).

In contrast, the nonlinear style of warfare is an attempt exploit the complex, dynamic nature of war. It focuses on concentrating friendly strength on enemy weakness. It looks for centers of gravity to target through multiple means simultaneously to paralyze the enemy. It is interesting to note that nonlinear not only describes the nature of the environment, but also the style of warfare needed to work within it. Nonlinear or asymmetrical is the direction that that all services are headed. Within this concept, the idea of "self synchronization" is simply another way of saying mutual adjustment

Last, support and stability operations, by their nature, are a unique category due to the human complexity and regional situational factors that impact on the organization. Throughout the 1990's, in peacekeeping and peace enforcement missions, we forced combat units to adjust their output and the technical aspects (types of equipment) of their organization to meet the challenges of these unique missions. Within three of the four quadrants, there is always a fundamental necessity to adjust the organization to meet the environmental conditions.

What we have found in practice is that actual operations fit more into the complex/dynamic quadrant, and thus require a different structure and coordination mechanism to be successful. I believe this represents the nature of the current battlefield, and what we picture the future asymmetrical battlefield to look like. It is interesting to the note that at both NTC and JRTC, missions are constructed to induce elements of a

dynamic/complex environment in order to test combat organizations. The future combat environment is likely to be one that rapidly transitions between a stable/complex, dynamic/simple, to dynamic/complex, and back again, or encompasses all three environments simultaneously. By remembering Marine Corps General Krulak's (1996) concept of the "Three-Block War" as a realistic conceptualization of the future battlefield environment, one can begin to see the interrelationship between organizational structures and environmental states as described by Mintzberg. This understanding should dictate a move to decentralization and mutual adjustment and more networked organizations to deal with the dynamic/complex nature of the environment of war. At this point, it is important to survey the different approaches to changing the organizational structures of land forces to see if real change is proposed.

D. ALTERNATIVE ORGANIZATIONAL APPROACHES

1. Breaking the Phalanx

In Douglas A Macgregor's (1997) seminal book *Breaking the Phalanx*, he outlines how the army needs to change its organizational structure to ensure its future relevance. He argues that future conflicts the US will face will be smaller, more frequent, and the goals of these conflicts will be more ambiguous (pp. 21-22). Accordingly, in his view strategically mobile, self-contained land forces are key to maintain strategic dominance in the 21st century. They constitute credible force that can "win wars, restore order, and preserve a stable and prosperous peace wherever direct American influence is required" (p25). His book points out the need to move from divisional structures (industrial age warfare organization) to an intermediate force design, combat group (information age warfare organization). His focus is to make US Army forces more usable and to help them fit into joint warfighting organizations. MacGregor does an excellent job detailing a structural and monetary path to make this happen. In short, it is a full blueprint for change.

The combat group would be the self-sufficient combat organization, or unit of action, for the army. This transition from the division (which lacks not only rapid strategic mobility but also does not plug effectively into the JTF), to the combat group (smaller than the division but larger then the brigade), would allow the US to employ

decisive land forces throughout the globe in support of Regional CINCs. Although five years old now, Macgregor's work emphasizes the importance of information on the future battlefield. He proposes the creation of an organic C4I Battalion, within the combat group. It would provide C2 structure, and consolidate many of the functions that support direct and indirect fires (UAV, COMMS "plugs and pipes", Intel, NLOS attack systems, ADA, CHEM and MP). Further, this C4I battalion could serve as the nucleus of JTF command structure if required (pp71-73). Macgregor updated his ideas about transformation and redesign in the article "Resurrecting Transformation for the Post-Industrial Era"(2001) In this article he reemphasizes the need for new land force design and expands on these ideas. He introduces the concept of a joint readiness deployment cycle; an 18-month cycle broken into three six-month phases (pre-deployment/training, deployment, reconstitution) into which smaller Army combat groups would fit. This shift to a deployment cycle (modeled after the Marine Corps) would bring the Army in line with the other services (2001, p 4). He also advocates the central need to make transformation a joint endeavor: "New joint operational concepts and structures that integrate diverse service capabilities require new joint operational architecture to be effective"(p 5).

Essentially Macgregor sees the need for a fundamental organizational shift, from a large, unwieldy force structure to a smaller, more mobile forces that incorporated new capabilities, enabled by the information revolution. His idea addresses the question of strategic mobility. Different configurations of the combat group (heavy, airborne-air assault, heavy /light recon strike) account for different mission profiles and allow for better force tailoring. These combat groups would be self-contained task organized teams. Because of this organic design, internal friction could be reduced through the development of habitual relations, common experience and the development of trust between units. His ideas may have seemed radical to some, disinvesting in the traditional division structure, but if one looks at the structure of the US Army's Armor Cavalry Regiment (ACR), this type of organization was already present in the army and proved itself very successful both in Vietnam and in Desert Storm.

2.   Air-Mech-Strike

An alternative approach to transformation forwarded by Grange, Wass de Czege, Liebert, Jarnot, and Spark in; *Air-Mech-Strike: 3-Dimentional Phalanx* (2000), is primarily an equipment-based solution, and it is designed to transform the US army's warfighting organization in to a full spectrum maneuver force that will dominate in the 21st Century. Their pragmatic approach is to transform all the divisions in the army by giving them medium-weight capability, which will then allow these units to conduct 3-dimensional maneuver of mechanized forces. This change would be accomplished through the adoption of a mix of vehicles, consisting of a lightened version of M113A3, the German *Wiesel* (light recon vehicle), The Flyer21 (a smaller HMMWV) and Polaris ATV (2000, pp102, 75,174-176,). These vehicles, coupled with our existing fixed and rotary wing transport capability, would enable strategic, operational, and tactical mobility currently unavailable. This mobility would, in effect, be transformational and allow us to realize true maneuver: "The AMS commander has flexibility, through maneuver options, to preserve freedom of action in all types of terrain" (p 22). This approach advocated by Grange, et al, is focused on overall transformation across the entire army, and in the conclusion of *Air-Mech-Strike: 3-Dimesional Phalanx*, the authors sum up the reason why this is a better approach than the current IBCT.

> The current approach is to create separate "medium" type brigade, heavier than light and lighter than heavy. This solution to improve strategic deployability, increases firepower for the light force, enhances protection action in most situations can operate satisfactorily across a wide range of scenarios. What it does not do is ensure that there is a strategic and tactical capability to put forces in the right position to fight, attaining "Positional advantage" over the enemy. This can only be achieved if our forces have a three dimensional, combined-arms capability that provides the commander with the ability to move faster, cross obstacles and exploit the enhancements of situational awareness; in order to take full of advantage of the enemies' disposition. We need to have this capability across the entire force structure with multi-functional divisions, brigades and battalion to meet the increasing optempo of a small Army. (2000, p 276)

In contrast to Macgregor's combat groups; "air-mech-strike" marginally changes the Army's organization structure, holding onto to the notion that the divisional structure is the focus for theater conflict. Though it seems well thought out, their concept appears to fit into a "what can we do quickly and cheaply" paradigm. In light of Mintzberg's

ideas, retaining the division template does little to adapt AMS structure to the environment presented by current or future conflict. At best, Air-Mech-Strike transforms light infantry forces, which do not possess mobility, sustainability and survivability, and marginally improves the mobility of heavy forces by providing the ability to air assault medium/light weight mechanized forces to gain positional advantage. It is questionable whether the addition of this new maneuver capability would substantially change how we fight, or the effectiveness we achieve. More importantly, AMS raises the question of whether currently trained commanders could overcome old habits, and fully realize the combat potential of this force.

3.   IBCT

Finally, we should look at the direction that Army transformation is actually taking with the creation of Interim Brigade Combat Team organizations. This effort is the outgrowth of two major events: First, Army Chief of Staff Gordon Sullivan's vision of change embodied in this Force XXI concept:

> Force XXI-must be prepared to face the full spectrum of operational environments ... Therefore, our Army must design organizations and develop capabilities that will allow it to be rapidly tailorable, rapidly expansible, strategically deployable, and effectively employable as part of a joint and multinational team to achieve decisive results in future war and OOTW in all operational environments. (TRADOC Pam 525-5, 1994, p 3-1).

Sullivan saw the need for the Army to change in order to deal with an uncertain future. He believed in creating an environment of experimentation to establish the best course for change in the Army. Throughout the 1990s, the Army conducted a series of Advanced Warfighting Experiments (AWE) to develop technologies, structures, and doctrine for the 21st century Army.

Other issues that catalyzed the creation of the IBCT were the problems of mobility and joint integration exemplified by TF Hawk in Kosovo (Owens 2001, pp196-200). Current Army Chief of Staff General Eric K. Shinseki realized that the Army needed a medium weight force that was strategically mobile, but also a force that would leverage all of the technological advances the army had gained through its experimentation. He also added a no nonsense approach to the necessity for change in

the army. According to Shinseki, " If you don't like change you're going to like irrelevance even less…. The army must change because the nation cannot afford to have an Army that is irrelevant"(Shinseki, 2001)

The IBCT is actually very close to Macgregor's combat group. It is formed around a brigade organization, but incorporates some new and unique capabilities and organizations. First, it is a fully self-contained combat team, meaning that all of the sub elements are organic to the brigade (figure 9). Because of this fact, all sub units answer to the same brigade commander, establishing unity of effort and control. As with Macgregor's combat groups, this should reduce internal friction as well, making the organization more "self-synchronizing"
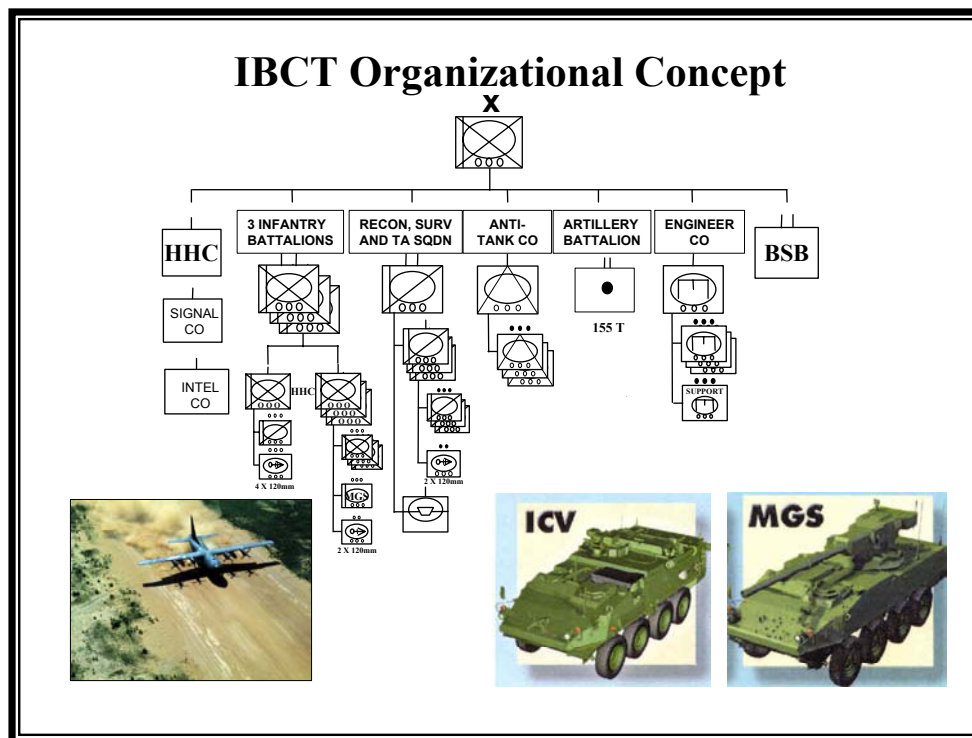

Figure 9.   IBCT Organization [3]

Along with the traditional three maneuver battalions, the IBCT has an organic Reconnaissance, Surveillance, and Target Acquisition Squadron (RSTA). The RSTA squadron is organized along the lines of a cavalry squadron, but with many enhanced

[3] This graphic copied from Brigade Coordination Cell brief "IBCT Org & Opnl Cliff Notes" (March 28, 2002)

capabilities (e.g. UAV and organic HUMINT). In many senses, it provides the ISR capability that Macgregor's C4I battalion was intended to. In addition to the maneuver battalions and RSTA squadron are an anti-tank company, an artillery battalion, and a brigade support battalion. Of special interest is the size and capability of the signal company needed to support the increased digital connectivity of the brigade. It contains many assets normally retained at division level.

The IBCT seems nearly an incarnation of the combat group that Macgregor posed back in 1997. Because of its decreased size and youth, it could have the ability to break with some of the standard, machine bureaucracy characteristics inherent in our divisions (centralization, standardization of tasks). However, because it appears to be interchangeable with the old concept of the brigade within the division structure, its full potential could be stifled. It is interesting to note that the two IBCTs created to date are located at Fort Lewis, a post that has no division level headquarters. This fact, is likely to reinforce the autonomous nature of these combat organizations.

The real question is, armed with the concepts gained from organizational theory, do any of these approaches help to create a fundamental design change that fits the dynamic/complex environment within which these forces must be effective? All three of these approaches miss a fundamental concept, advanced by John Arquilla and David Ronfeldt in their final chapter of *In Athena's Camp* (1997) They offer a concept regarding information and how organizations balance their interpretation of information between a processing and a structuring point of view (pp 446-447). They outline an "information pyramid" made up of four levels: data, information, knowledge and wisdom. The first two levels are primarily concerned with a "processing" view of information. The second two levels emphasize the "structural" view (p 448). After their analysis, Arquilla and Ronfeldt conclude that both aspects are needed, but that the structural view of information is the dominant perspective. Given this view, organization and culture become the predominant factors because they determine how information is not only processed but more importantly how it is structured within the organization that leads to shared knowledge and understanding.

In terms of organizational theory, this structuring of information could be construed as how and what type of coordination mechanism is favored. Mutual adjustment equates to information flow that enables shared understanding of relationships and situations, and one that allows autonomous decisions to be made between elements to support each other. For this mechanism to work successfully, priority and authority must freely transition between combat entities. Direct supervision seems to fit a <u>two-way</u> flow of information but a <u>one-way</u> flow of authority: before you make a major decision, it has to be cleared by a higher authority. Worse, in terms of flexibility, direct supervision fosters a situation where one is required to follow a set plan and only act when the high authority dictates. Standardization of tasks and output focuses on following a fixed formula to process information, where authority is distributed throughout an organization (i.e. to the staff), and there are heightened levels of ambiguity as to where that authority lies.

Another point is the idea of how organizations develop knowledge and understanding. The sensor arrays and battlefield digitization architecture primarily pass data and information that still has to be processed and analyzed before it can be arranged in a meaningful way to provide understanding and knowledge. A preoccupation with technological solutions to enable information structuring suggests a misunderstanding of processing as structure. Though some technology advances will help to fuse differing information inputs into a somewhat integrated representation of reality, whether this artificial intelligence will rise to the level of understanding and knowledge is an open (and key) question.

At the heart of these questions is the idea that for the Army to be more effective in a dynamic, complex environment, it must to move to a coordination mechanism of mutual adjustment. The result is a flattened networked-type organizational design. Currently, in most senses, all the Army has done is overlay networked computer systems on our old hierarchical organizational design, while maintaining direct supervision and standardization as the method for coordination. No matter what we believe or what we keep saying, this does not equate to a network structure. Retired, Army Chief of Staff Gordon Sullivan warns about this very same point when he cautions "The old maps, the old ways of doing business will not work in today's new territories. Simply improving an

existing process will not solve a problem… Doing the same thing you have always done- no matter how much you improve it- will get you only what you had before"(Sullivan & Harper, 1997, p152). Clearly, as the discussion expands to technical aspects of transformation, the theme of information structuring and the role of organizational design will crop up again.

V. TECHNOLOGICAL DIMENSIONS OF THE "DIGITIZED BATTLEFIELD"

A.   INTRODUCTION

Over the past decade, the US military has fundamentally changed its vision of how future wars will be fought. According to this new vision, we have moved from the Industrial Age into the Information Age. War has always evolved, from ancient to modern times. Since the end of WWII, we have witnessed this evolution of warfare. With each new conflict, military strategists and tacticians redefine the nature and the core competencies that are elements of success. Currently, all the services are trying to define their roles in an uncertain environment. The Navy's "Network Centric Warfare", an idea that reconfigures existing systems and structures in innovative ways, is its attempt to exploit the new information paradigm. Alternatively, the Army's "Digitized Battlefield" is both a <u>bottom-up and top-down attempt</u> at an integrated system of systems, building a fully functional C4ISR architecture which links all levels of command and control. This system of systems will scale from the theater Commander all the way down to individual vehicle and soldier. At the core of both of these operational concepts, the US military believes that information is the foundation of power in the future battlespace. Through the structuring, management, and exploitation of information, we will become an irresistible force that will render our enemies powerless against us. This fundamental premise has yet to be tested and proven on the battlefield. What is clear, however, is that there appears to be a quantum leap in the application of technology as the primary engine of change to enable our future operational concepts. In addition, the idea that the nature of warfare has been fundamentally changed, by our ability to harness the power of information through the application of technology, is gaining acceptance throughout all services and into the US government as outline in concepts in *Joint Vision 2020*.

B.   ROLE OF INFORMATION

With our doctrinal underpinnings relying on the use of information, technology once again plays a primary role as an enabler in defeating our enemies. The question right now is: does the technology really support our vision of how we will fight and win

our wars? The first test is upon us in the new century. As military commanders, we need to look hard at what we have built, and the direction we are heading to ensure that we do not place a false trust in technology and create a "paper tiger", which crumples under the stress of war. To clearly understand the reasons for the U.S. militaries central focus on the technological dimension of transformation we must first look at the future vision of how we as a nation intend to fight war which is articulated in U.S. military's *Joint Vision 2020*

C.   JOINT VISION 2020

Joint Vision 2020 is the official vision for the future transformation of the armed forces. "It defines general analytical focus…"(p.3). The vision's bedrock framework consists of the concepts of strategic context, full spectrum dominance, and information superiority.

Central to the idea of "strategic context" are three major facts about the future of war. First, the US is a world leader and has global interests, which will bring us into conflict with many parts of the world, and with a diverse range of adversaries. Second, because of the diffusion of technology throughout the world, our future enemies will have access to many of the same technologies that the US currently possesses. Finally, these future enemies will be highly adaptive to our current and future capabilities. They will seek asymmetric methods and objectives to maintain dynamic and flexible retention of the initiative (p 4-5).

The next fundamental concept, full spectrum dominance, says that the ultimate goal of military force is to accomplish the political goals directed by the NCA. central to this vision is the notion that future forces have to be both flexible and responsive, operating successfully throughout a spectrum of operations; from peace engagement, through deterrence & conflict prevention, to fighting and winning wars (pp 2-3, 6). Of interest is the treatment of the concept of friction. According to the text:

> Additionally friction is inherent in military operations. The joint force of 2020 will seek to create a "frictional imbalance" in its favor by using the capabilities envisioned in this document, but fundamental sources of friction cannot be eliminated. We will win-but we should not expect war in the future to be either easy or bloodless. (p 6)

This statement voices a belief that no matter what advances are made, friction will always be with us.

The last concept is that of "information superiority." It is a belief that the information revolution has qualitatively made a difference in our ability to exploit information to gain advantage. However, the concept is not confined to the technologies, or our mastery of them, but the fact that information superiority leads to "Decision Superiority"-

> Better decisions arrived at and implemented faster than an opponent can react, or in a noncombatant situation, at a tempo that allows the force to shape the situation or react to changes and accomplish its mission. (p.8)

The text talks of the technological advances that will make this possible, but ends with a clear statement that "information superiority" does not equal perfect information or an elimination of the fog of war. I would be derelict in my interpretation if I failed to reiterate that JV2020 is not an adopted doctrine, but solely a framework to provide direction. Having said that, oftentimes in the military the lines between vision, doctrine, and dogma become blurred. Therefore, it is imperative that we continually assess and make course corrections, or we are in danger of creating systems which, when fielded, do not support the basic ideals on which they were created. It is important to take a look at how different services are applying technology to achieve the concept of information dominance. For this thesis the focus will be place on assessing only the U.S. Army's "digitized battlefield" concept.

D.   THE DIGITIZED BATTLEFIELD AND ARMY BATTLE COMMAND SYSTEM

The Army's ABCS is the Digital Battle C2 system of systems of the present and future. The intent, when complete, is to integrate all the digital C2 systems from theater to tactical, and basically allow commanders at all levels to share not only information but to generate a Common Operating Picture (COP) of the battlespace to facilitate command and control. Though the system encompasses many systems, from Global Command and Control System (GCCS) to Army Tactical Command and Control System (ATCCS), I will maintain my focus on the latest addition, Force XXI Battle Command Brigade and

Below (FBCB2) digitized C2 system (figure 10). This new system links the actual warfighter all the way back to the theater commander. The following is how the army articulates what this architecture will provide the commander:

> "The Army Battle Command System (ABCS) is designed to provide the battle commander and his staff with access to operational and tactical near-real time, accurate, mission-critical information to support effective command and control (C2). ABCS will assist the commander in exercising command and control of available forces to accomplishment a mission. It will allow him to "see and understand" his battlespace and gain dominant situational awareness on the Army XXI battlefield….ABCS will assist him in the art of command by allowing him to apply his judgment more productively and rapidly, to use his command presence more efficiently, to develop and disseminate his vision effectively, and to understand better and more quickly the dynamics of war (in general) and the specific operation in particular.(2001)

There are two principal components of the architecture. First are automation components, stand-alone sub systems consisting of:

- GCCS-A

- Army Tactical Command and Control System (ATCCS)

- Maneuver Control System (MCS)

- Advanced Field Artillery Tactical Data System (AFATDS)

- Air and Missile Defense Work Station (AMDWS), part of the Forward Area Air Defense Command, Control, Computers, and Intelligence (FAADC3I) system

- All Source Analysis (System (ASAS)

- Combat Service Support Control System (CSSCS)

- Force XXI Battle Command Brigade and Below (FBCB2)

The second are communication and information enablers, the backbone of the network, consisting of:

- Army Data Distribution System (ADDS)

- Warfighter Information Network-Terrestrial (WIN-T)

- Combat Net Radio (CNR)

- Military Satellite Communications (MILSATCOM)

Connectivity for the system is provided by tactical communications consisting of MSE, NTDR, single channel ground and airborne radio system (SINCGARS), enhanced position location and reporting system (EPLRS), and at brigade and above the WAN/LAN/switch/router architecture.
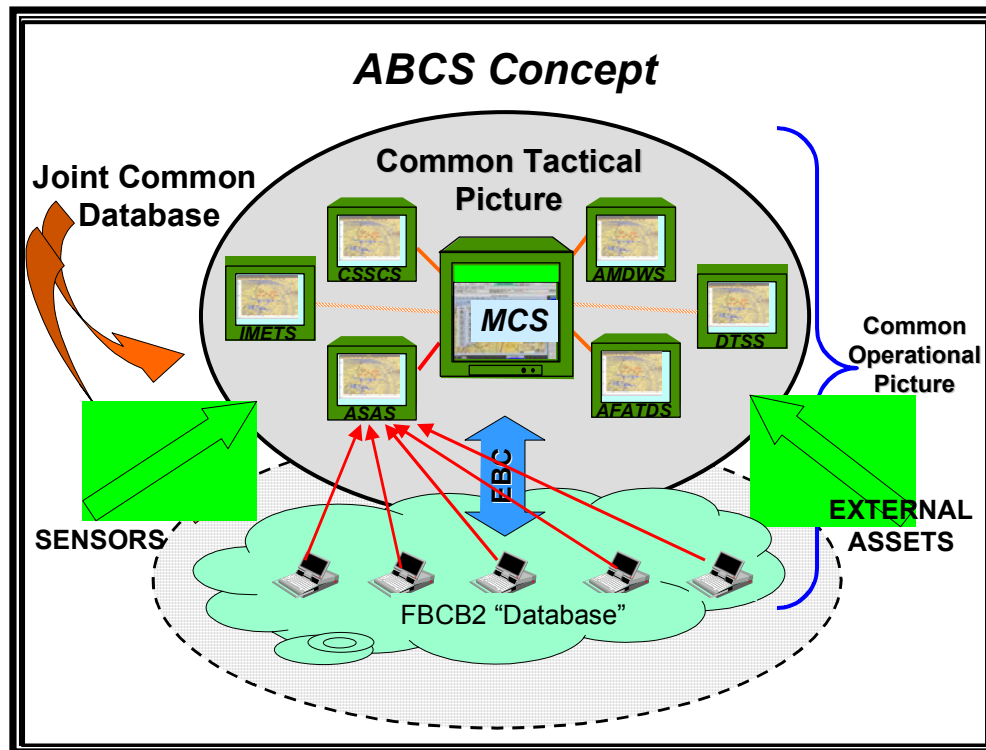
Figure 10.   US Army ABCS concept[4]

The overall Network architecture of the system is divided into two portions of this "tactical internet", the Upper TI and Lower TI. In essence, this is really a division of the backbone communications systems over which the digits flow. Overlap in the system occurs at the Brigade level, which primarily becomes a hub where higher and lower automation and communication components reside. Critical to the functionality of this overlap at BDE is the fact that the lower TI has much smaller pipes over which data is transferred.

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[4] This graphic copied from Brigade Coordination Cell brief "Transforming an Army" BCC 101(April 10, 2002)

1. FBCB2

What exactly is FBCB2? To this point, it has been described as a section of the lower portion of the "Tactical Internet". It is a sub-system of systems made up of software embedded at the TOC, hardware and software that link combat entities-both vehicles and individuals-to the TI, the interfaces and integration for the other ABCS systems, and finally all the supporting communication to transmit all the data.

What does it give to the warfighter? Foremost, it provides the common operating picture (COP), or as the Army terms it, <u>situational awareness</u> (SA). SA is defined as the ability to see yourself, see the enemy, and see the battlefield (Figure 11). This COP of the Battlespace, according to the Army, leads to <u>situational understanding</u> (SU), which "provides the leader with the ability to comprehend a situation, recognize likely actions that will occur, and allow the commander the ability to determine an appropriate response"(2001,p.7). This ultimately leads to <u>situational dominance</u> (SD), which is the act of winning on the battlefield enabled by SA and SU. SD is the linchpin that allows US commanders to get inside the enemy's decision cycle, and by making faster and more precise decisions, overwhelm the enemy. It is critical to understand how the system generates the RED and BLUE SA pictures. Friendly icon position locations are updated automatically by the system and enemy icons are inserted by users, through SPOT reports (bottom up), as well as top down from the ASAS box.

Along with SA, the system provides the commander digital tools to facilitate command and control. A short list of the tools include collaborative "whiteboard" planning, net meeting, chat function, email, Battlefield Planning and Visualization (BPV)-a digital planning, war-gaming, and rehearsal application. All of the features are intended to allow the commander to communicate his ideas and orders quickly and precisely to his subordinate units. On the surface, FBCB2 seems to do everything as advertised. This is a command and control godsend. Nevertheless, how does it fit in the future vision of combat operations as outlined in JV 2020?
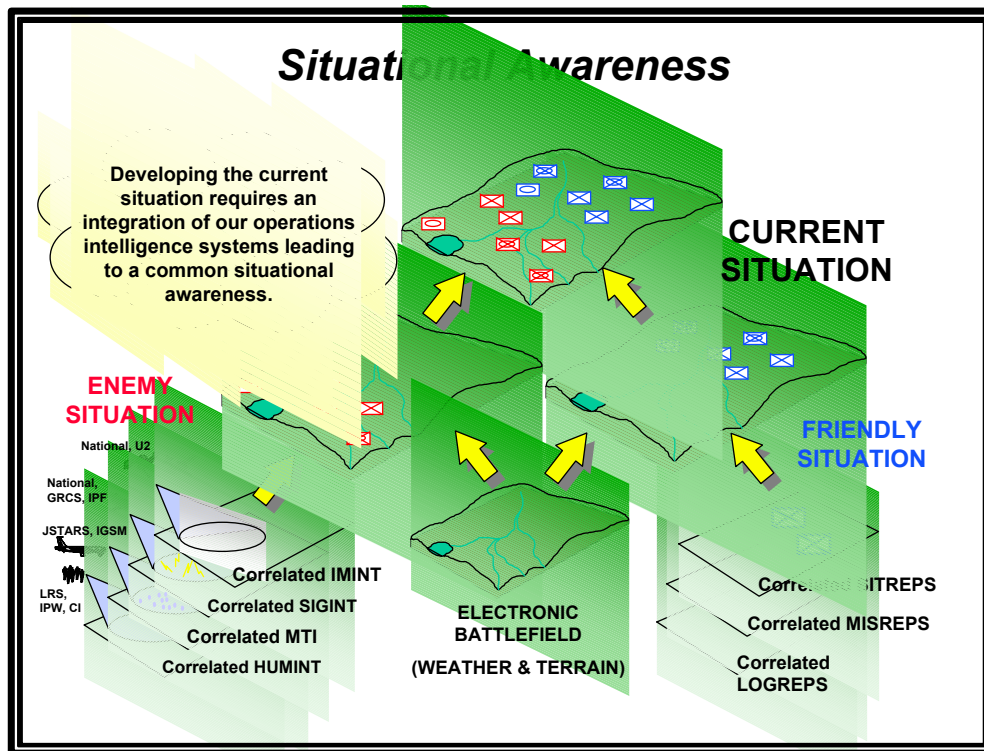
Situational Awareness

Developing the current situation requires an integration of our operations intelligence systems leading to a common situational awareness.

CURRENT SITUATION

ENEMY SITUATION

FRIENDLY SITUATION

National, U2

National, GRCS, IPF

JSTARS, IGSM

LRS, IPW, CI

Correlated IMINT
Correlated SIGINT
Correlated MTI
Correlated HUMINT

ELECTRONIC BATTLEFIELD
(WEATHER & TERRAIN)

Correlated SITREPS
Correlated MISREPS
Correlated LOGREPS

Figure 11.   US Army's Situational Awareness[5]

E.   HOW WELL DOES FBCB2 SUPPORT THE JV2020 BEDROCK CONCEPTS?

Remembering Admiral Owens' vision of the future battlefield, technology has created a joint interoperable system of systems based on a SEE-TELL-ACT paradigm, which leads to dominant battlespace knowledge, near-perfect mission assignment, and immediate/complete battle assessment (2000, p 99). FBCB2, when totally fielded, will be an integral part of this system. What is troubling to me is the pervasive fundamental concept that this C4ISR System allows commanders to make the intellectual jump from awareness, to understanding, to dominance. Only cursory discussion is given to how a commander and his staff make this leap from the science of war to the art of war. What is evident, as one studies the complex FBCB2 system capabilities and limitations, is that the system is not without some basic drawbacks. This is most likely due to the fact that some of the technology is still not mature enough for the rigors of combat environment. The tension between the capabilities and limitations is the result of trying to field a workable system as soon as possible to large-scale units.

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[5] This graphic copied from Brigade Coordination Cell brief "Transforming an Army" BCC 101(April 10, 2002)

1. Limitation of the FBCB2 System

The "smart books" created for the AWE-Division Capstone Exercise (DCX), conducted March 2001 at Fort Irwin, Ca, hint at several problems inherent in the system. They loosely attempt to explain examples of procedural "wetware" fixes that will overcome these limitations, though they do not address the deeper issues. We are already creating procedural work-arounds so that the operationalized system supports the fundamental vision concepts. The following are the basic architectural problems.

a. Unix vs. NT interoperability

The problem here is the fact that the army, over time, has cobbled together differing hardware and software systems. The older legacy systems i.e. ATCCs upper TI BOS specific boxes are Unix based, and elements of the newer FBCB2 and MCS light systems tested during JCF-AWE in Sept 2000 at JRTC are Windows NT based. Unfortunately, Battlefield Planning and Visualization (BPV), the primary collaborative planning tools, becomes moot because of this fact. As referenced, "BPV is a self-contained software application that interacts directly with MCS, as long as an intra-TOC LAN, Unix-to-Unix capability is available. It currently will not communicate with any NT-based software system; i.e., MCS-Light."(2001, p14) All TOC within the army currently have elements of both operating systems functioning. By adopting Windows as our administrative peacetime OS system, we have carried it into our wartime systems. Using emulation software, the gap can be bridged, but at the cost of functionality and reliability. What is evolving is a complex system of software patches to wire the systems together, and I fear we are getting the worst of both worlds- the reliability problems of Windows and the basic usability problems of Unix.

b. Hard Framework Network

The conceptual problem is the fact that as the network, i.e. the Tactical Internet, is configured with a predetermined IP, architecture that is difficult to reconfigure. Symptoms of this problem are the discussion of C2 Registry and Unit Task Organization (UTO). C2 registry is based on Lightweight Directory Access Protocol Data Interchange Format (LDIF), which is burned in the computer hard drive based on a plan developed by the G6. This is a map of the computers on the network, and the subnets they belong to. Each of the subnets is assigned a block of IP addresses. Any

computer in the subnet can act as a server; out of this fact arises timing of subnet-ABCS router affiliation problems. It thus becomes imperative that the subnet server comes up first, versus a client system, to affiliate with the router and receive a Server IP address. The major wartime problem is a security issue since it is difficult to reconfigure the network. Once it is compromised, the entire network is map-able and exploitable.

The other problem is adjusting the unit task organization (UTO). UTO, is directed by the commander and inputted into the system. According to the text, any changes to the UTO should be preplanned so that they can be executed quickly. All systems within ABCS have to have the same UTO loaded, so that correct statistical information, as well as message traffic, can be tracked, and passed about friendly forces on the battlefield. It is unclear if the UTO can be adjusted at a single point within the system and update all systems on the net. I do not believe this is true, because they give examples describing how it must be updated in MCS box (ATCC), FBCB2 S6-box, and in CSSCS box. This points to a "stovepipe" problem within the system.

In my duties as an Observer Controller within the plans and exercise maneuver control cell at JRTC, task organization changed, at times, on a daily basis, and sometimes shorter. Task organization is also the primary method for the commander to tailor his forces for the mission, and once configured in the commanders' mind, it is the primary source of knowledge that leads to critical decisions. The problem, as I see it, is a wetware-SA screen disconnect. If the database is not updated to reflect the true combat configuration of units on the battlefield, the commander and his staff could be misled by the blue SA on his screen unit, adversely affecting his decisions on use and employment of his units to a given enemy action. Bottom line, he commits a unit which is not suited to counter a specific enemy situation. The system enforces a rigid technological framework, as well as constrains the commander conceptually through precise data input requirements of the system.

c. Red SA

The enemy picture on the system is adjusted from the top down and from the bottom up. They link what is presented on the All Source Analysis System ASAS box – fed from a myriad of strategic ISR sensors, most notably the JSTARS feed. The soldier and scout at the tactical level can add red icons by initialing a spot report. Once an icon is

created, it can and will populate the system. The weak link here is double representation, through ASAS picture and FBCB2 red SA picture. Turning off the ASAS picture can filter this out. But will this happen all the time? For the system to actually fuse the two sources correctly, it must occur in the Brigade S-2 cell. Thus, it is critical for the commander to internalize that the red picture is just a representation, not a real-time reality. For that leap to take place, acquisition and targeting radar would have to be pushed to brigade and lower.

d. Battlefield Geometry

The final problem is a point of friction that I witnessed first hand during the JCF-AWE, that of battlefield geometry. The problem arises when you create graphics on the system. The only system that has the power to create true fire control geometries is the Advanced Field Artillery Tactical Data System (AFATADS). Fire control geometries empower digital clearance of fires off the SA. The fact emerges that simply because you draw the graphic on your FBCB2 box, it does not equate to the digital empowerment of that graphic throughout out the system. Any one of these problems does not render the system useless, more the fact that as currently fielded, the very system that is intended to reduce friction and fog introduces its own elements to the warfare environment.

So how does FBCB2 add up when we place it in the JV2020 contextual framework? Clearly, it is an attempt to develop a system of systems that supports the operational concept of dominant maneuver, focused logistics, and precision targeting. It is an ambitious first attempt to reach a new operational paradigm of; "see first, understand first, decide first, act first, and finish decisively". Situational Awareness at this point in the evolution of the digital battlefield is that we have not transitioned to situational understanding, or for that matter situational dominance. The Army is moving to an "adaptive thinking training methodology", which is a training methodology for facilitating the move to situational understanding. The reality is that situational understanding is simply the ability to interpret the patterns that are being displayed. Thus, a commander fuses what he is seeing on his FBCB2 screen with past experiences, and interprets the patterns to gain the enemies intentions. This works well against the soviet style tactics that follow doctrinal modes that one can template e.g. a US commander realizes what is happening because he has identified the enemy CRPs, which

is followed by the advance guard main body. The first echeloned main body force follows the AGMB. By seeing this pattern, the US commander understands where the enemy main effort is and focuses his attention and his assets on destroying massed enemy forces. On a nonlinear battlefield where the enemy is intermixed with friendly forces and civilian population, the patterns are much more difficult to interpret, and will require trusted human feedback loops to confirm the educated guess that is being made.

These limitations point to inflexibility and adaptability problems inherent in the current digital architecture. Advances in self-configuring network technology provide one set of fixes. Others are emerging software and hardware fixes to integrate multi platform networks. The problem still remains, and if the Army settles for what it has now, it will quickly be outmatched by what is available in the public sector.

It was pointed out to me, in a personal conversation with the Senior OC present at the DCX, that "We (US Army) are at the very beginning of a long process-digitization is not a quick fix." I very much agree with his point, and the fact is, JV2020 is a vision and not a reality. The problem is that very real limitations currently exist in the Army's ABCS system, and unless it identifies and fixes the system at the core, we are in danger of fielding a friction-rich system which will have a cascading effect on interoperability in the future. Can we fix it? I believe so, but we need to ensure that the overarching concepts of JV2020 are actually the concepts that drive the system we ultimately create.

F.   VULNERABILITIES OF DIGITIZED BATTLEFIELD

The digitized battlefield is designed to capitalize on perceived leap-ahead technology that will enable decision superiority, but if one examines the system more closely, it also seems to open US forces to new frictions and vulnerabilities. First is the increased level of complexity and the wet-ware work-arounds that have to be incorporated to ensure success. If one applies the concepts discussed in chapter III, the level of complexity is exponentially greater in a unit that is fully digitized. The probability of cascading, or unforeseen failure seems extremely high, and has been a major element in all of the advance warfighting experiments to date. System crashes, overloads, and both blue and red SA update problems are points of concern, but

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legitimately, if we want to leverage information as a basis for the creation of combat power, these issues have to be allowed to exercised and solutions identified.

The more alarming condition that is not being discussed is the fact that the CROP is a picture that can, and will, be manipulated by our future enemies. From our perspective, it is Van Creveld's "directed telescope" that allows us to gain a better understanding of both the friendly and enemy situation. However, if one looks at it from the perspective of the enemy, it is a ready-made conduit for deception. In addition to that aspect, there is similar danger of increasing misperception, resulting in self-deception.

Deceptions are as old as war itself. Sun Tzu stated "all warfare is based on deception" and the use of deception has permeated warfare throughout history. In its most simple sense deception is a combat multiplier that enhances capability or reduces vulnerability of a force. It seems to be favored by weaker forces to gain an advantage over a numerically or technologically stronger opponent. In their work on deception, author James Dunnigan and Albert Nofi lay out the basic techniques of deception which include (pp7-9):

- Concealment
- Camouflage
- False and Planted Information
- Ruses
- Displays
- Demonstrations
- Feints
- Lies
- Insight

These techniques incorporate both passive and active forms of deception but are based on understanding "what the enemy expects to see or wants to see", and presenting him with a picture that fits his preconceived belief of what his opponent is both capable of and what he will most likely do. All deception is based on exploiting these certain "perceptual biases", which is due to the nature of how human beings mentally process information and assimilate individual perceptions of their environment. In his paper,

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"Cognitive Factors in Deception and Counterdeception" Richard J. Heuer, Jr (1981) defines these underlying psychological biases, which are part of how humans construct a reality that makes them susceptible to deception. In essence, human beings are susceptible to many types of bias (patterns of errors in perception and judgment) that deception then exploits (p32). Heuer focuses on two primary bias; cognitive bias, which results from the ways our mind work, and perceptional bias which are a result of nature of the processes of how we perceive the world (p 32).

Heuer gives a cursory discussion of motivated bias (based on our own ambitions and fears as well as our need to be perceived as consistent), and does not view it as a subset of perceptual bias. If we take a step back, and look at the work of Robert Jervis in *Perception and Misperception in International Politics* (1976), we gain a wider understanding of the effect that a wide range of perceptual biases have on human decision-making. These are biases based on large and differentiated sets of factors that run the gamut from cognitive consistency (reinterpreting what we expect by minimizing discrepant data) to the impact of immediate concerns on perception. They encompass misperceptions of centralization (view that our opponent is of one rational mind and is unified in action and thought), to overestimation of importance (over-confidence that we understand and can influence decisions and actions of others), to the influence of desires and fears (seeing what you want). Jervis' conclusion is that to minimize misconception, decision makers need to be aware of the impact of perceptual biases and the errors that they induce during decision-making. Armed with this knowledge, one can account for these distortions and try to correct or mitigate their impact (chap 12).

To maintain simplicity I will not use Heuer's terms but rather his concepts in respect to bias and deception. In terms of my discussion, perceptual biases will encompass both concepts of "presenting the enemy with what he expects to see" and "presenting the enemy with what he wants to see". The following is a list of the factors based on Heuer's review of bias and their implications for deception. Though these implications are not necessarily taken verbatim from Heuer, all the ideas are conveyed in his table 2.1(pp 62-63).

- Reinforcing what the enemy expects to see is more successful then trying to change it

- Once preconceptions are formed by enemy they are resistant to change; enemy often rationalizes conflicting information to fit what he expected

- The earlier the exposure to ambiguous enemy picture (disposition) the longer and more difficult it is to discern true nature of enemy intentions

- People are more likely to see what they are looking for or what they have seen in the past

- People want to be certain when making estimations, this leads to a problem of over confidence about how much they know

- Small bodies of consistent data are more likely to be believed than large amounts of inconsistent data

- People make judgments based on the evidence that they have, not the implications of the evidence which is missing; "out of sight out of mind"

- People want to view events as part of a logical causal pattern; randomness, accidents and error are discounted as explanation for enemy actions

- The behavior of the enemy is attributed to the nature of the people or culture that they come from instead of the situation in which the enemy has been placed

The question now is what does this understanding of these biases mean to the vulnerability of the Army's digitized battlefield, and the ideas of situational awareness, understanding and dominance? As mentioned earlier, the digital display allows near-real-time application of both the enemy and friendly situations (represented by icons) displayed on a digital map; this constitutes the common operating picture. The implications of perceptual biases on deceiving the friendly forces equipped with this type of information technology, is that the enemy has a 24hr-a-day conduit to provide deception pictures, not only to the soldier or scout on the battlefield, but also all echelons of commanders. Much of our intelligence analysis is based on the application of enemy doctrinal templates that depict how a certain enemy force should array itself on the battlefield. The commander's recognition of the enemy patterns should lead him to an understanding of options available to the enemy commander, which then gives the friendly commander the ability to determine the most likely enemy course of action. The problem that arises is that to deceive, the enemy simply has to array his troops or use decoys that provide signatures that replicate the template that he knows friendly forces rely on. A good example of this is "SCUD Hunting" during Desert Storm. The Iraqi's use

of plastic decoys, positioned where we expected, along with camouflage and "shell game" movement techniques of real mobile SCUD launchers deceived strategic and operational assets, as well as the pilots whose mission was to destroy them. The net result was there was no conclusive evidence that the US destroyed any of the Iraqi mobile missile launcher during those operations.(Rosenau, 2001) Additionally, once a commander believes he has identified the pattern, it is very difficult to change his initial perception or the assumptions that he has derived from that input. Finally, if the enemy arrays his forces in an ambiguous manner that is viewed at all times by commanders and staff, it physically takes them longer and requires more precise information to determine what the purpose and goals are of enemy actions.

Human perceptions are also affected by wants, desires and fears. This is considered motivated bias seeing what we want to see. The implications are that if you are looking for it you usually find it. We want to maintain consistency once estimations are accepted with some level of certainty, and both commanders and staff tend to display over-confidence in their understanding of what the enemy is doing. When evaluating evidence to make decisions, people have a tendency to reach conclusions based on small amounts of consistent information versus larger inconsistent sets of data. Couple this with the fact that we tend to focus only on evidence that we have and reject randomness, accident and error as an explanation of enemy actions, makes commanders and staff susceptible to misunderstanding, resulting in less than accurate assessments of a given situation. Finally, enemy actions are perceived as being based on their culture, motivation, and personality rather than the actual situation that is presented to them.

Viewed in this light, the varying system of systems that is supposed to provide situational awareness and understanding seems to increase our vulnerability to deception. It also creates a technological environment where perceptional bias induces new and unexpected levels of mental friction and misunderstanding that have to be accounted for and overcome. Most of this is due to the over reliance on technology to deal with the informational processing requirement of combat units.

G.   ROLE OF TECHNOLOGY- HISTORICAL PERSPECTIVE

The other major conceptual idea that seems to be unaccounted for is the role of technology in change. Military thinker Trevor Dupuy in his book *Understanding War* (1987) advanced an important idea about the actual importance of technology in warfare. In the chapter "Technology and Human Behavior in Combat", he asserted that historical data about war indicates that " no technology, no weapon however great its actual or potential lethality, has been more important for the winning of battles or wars as the men who controlled the weapons"(p212). He does concede that due to some circumstances, technology can be the dominant factor, but the larger historical perspective suggests "technology can upset, restore, or perpetuate a combat power balance or imbalance. But, the advantage is fleeting, rarely decisive, and never as decisive as promised or expected" (p 214). He expounds on the nature of assimilation of new technology. First is the idea that historical fact supports that it takes on average 20 to 25 years to fully assimilate new technologies into warfare (p212). The second major idea is that the time when new weapons or technology were the most effective was when there was a congruence between weapons of war and the methods of war (tactics and doctrine). A good of example of this is blitzkrieg (pp 216-218). Central to all his ideas is the belief that all theories, doctrine, tactics and technologies have to stand the test of actual combat before their validity and potential should be accepted.

H.   OPFOR INFORMATION PROCESSING AS AN ALTERNATIVE APPROACH

The US Army is spending hundreds of millions of dollars to create the digitized battlefield so that we can process raw data into useable information in order to make the best decisions. As discussed in Chapter IV, one framework for interpreting information is a processing view versus a structuring view. The information pyramid, as defined by Arquilla and Ronfeldt, places data and information in the processing realm, and knowledge and wisdom in the structuring realm. (1997,p. 448) within in this framework information technological improvement have the greatest affect on processing verses structuring.   So if current technology changes really only improve our ability to process information what or more aptly <u>who</u> does the structuring? An interesting case of how to

overcome both processing and structuring limitations is currently available in the US Army in the form of the OPFOR Force at the National Training Center.

There are many different theories why the opposing force at NTC is so good at fighting and winning brigade level combined arms battles. There is, of course, the home field advantage. The OPFOR knows the terrain and is able to use it to their advantage. In addition, they get to practice every month in the best training environment that the army produces. Everything is replicated and the level of fidelity is the best that the army has to offer. Some believe that it is that they are experts in the use of the multiple integrated laser engagement system or MILES. In essence, this laser tag system is their weapon and they train to maximize it fully, while understanding its limitations. Last but not least, is there is a high level of "gamesmanship" in the tactics that the OPFOR uses to exploit artificialities in the training exercise and scenario. An OPFOR commander has an alternate perspective because the OPFOR is able to realize all the combat potential within its organizations through training tempo and training focus to optimize them at brigade level combined arms battle (Rosenberg, 2001). From Rosenberg's point of view, it is not the fault of the regular army rotational units, since they simply are not allowed to realize their full combat potential, due to many different factors with which the OPFOR does not have to contend.

Though all of these perspectives shed some light onto the reason for their success, one factor is overlooked in all discussions on the matter, one which I believe is key. The leadership ratio within the OPFOR units is twice that of BLUFOR units. What is meant by the leadership ratio is actual number of same rank officers and senior NCOs in a given OPFOR combat formation compared to its corresponding US Army combat unit.   The reason for this is a unique circumstance to the 11th ACR, which consists of two maneuver battalions (a tank battalion and an infantry battalion) and a support battalion. Together they replicate an entire OPFOR regiment. During a rotation, they create a Soviet-style regiment, which is made up of four Motorized Rifle Battalions (MRB). The OPFOR MRB is created by joining a mechanized infantry company and a tank company. Thus, an MRB has two captains commanders- for ease of C2, one is designated the commander and the other becomes the deputy commander (these captains exchange positions every other rotation). Therefore, within the OPFOR Regiment, there are two commanders, two

complete staffs that work together, and most importantly there are two lieutenants acting as a commander and deputy commander in every motorized rifle company (MRC). With this unique command structure, there is inherent redundancy as well as leadership burden sharing. What does this equate to in battle? First, it is very hard to decapitate a unit like this even if a leader is killed, because there is always someone with the same level of training and education ready to take their place. Second, control is eased because there are two sets of leader points of view that can focus on not only the enemy situation and unfolding tactical problems, but can look internally to focus on reducing friction within the organization.

As detailed within the US Army's own operational doctrine, leadership is the key ingredient of combat power at the decisive time and place on the battlefield. The unit's overall learning curve is reduced, because when leader moves or changes out there is still another leader remaining to take up the slack and train up his new counterpart. This is all done without the use of any high technology; it is a low-tech solution to information processing as well as developing understanding. On a dynamic battlefield that is populated with multiple nodes of understanding in the form of combat leaders (major, captains, lieutenants, platoon sergeant), information is processed into understanding more quickly and at the point of tactical decision-making. The OPFOR combat organization quickly determines the information needed, shares it via the radio and acts on a shared understanding of not only what is happening but also what is not happening.

One could argue that Army combat units already possess this ability because we teach all of our subordinates to do our job (i.e., to be able to do the job one level up). This is only partially true because even though a lieutenant can step up and fill the shoes of his company commander, he still only possesses a basic educational foundation (based on his rank) and limited experience set (based on time and assignments). In contrast, a peer counterpart shares the same educational foundation and his experiences have the net effect of expanding the overall experience set of organization. The relationship between peer leaders is by no means perfect, and can be a point of tension due to personality and interaction. It has been my experience that the unifying factor that overcomes this peer leader friction is that of focus on the overall unit's goal, which is success on the battlefield. The most positive aspect of this dual-leader approach is at the battalion,

company and platoon level, because at all levels there is not only redundant leadership, but more importantly two distinct perspectives of combat maintained in the form of infantry and armor leadership. The result is the leadership team had twice the experience base as well as a more inclusive knowledge base. This is attributable to the varied training, assignments and education that each of these leaders brought with them to the team. In the end, this unique organizational structure resulted in tactical units of maneuver, which were able to quickly identify and overcome most tactical problems posed by the enemy due to the concentration of "wet-ware", not silicon technology.

Robert C. Holcomb of the Institute for Defense Analysis seemed to reach a similar conclusion when asked to comment on a briefing on the future direction of information technology and the Army. He stated:

> [the direction that the brief] seem to have chosen intelligent agents as a solution to the problem, and is working up a demonstration to "prove" it. I am not sure. Humans are very intelligent agents by themselves… very little [has been] said so far about the role of these human "intelligent agents" in the design and operation of the computer networks. Their role seems to be one of operation… Yet these Humans are far more capable than the computers that sit in front of them, having judgment, experience and emotion. Perhaps we ought to consider a network of humans supported by computers, instead of the other way round.(email, as cited in Spinney 2000)

Once again the focus of transformational technology seems to be on getting machines to do a certain amount of the thinking for us versus working on making the informational technology more responsive to the human, providing information in a format which helps leaders and staff process it in a more effective manner.

I. CONCLUSION

What are the implications of these concepts for transformation technology? First, the vulnerability of deception and misperception of situational awareness points out the need to first understand the vulnerability, and then mitigate the impacts. This can be achieved through training, and asking the right questions during staff assessment process, as well as considering the commander's own ideas as to how and why he believes what he does about the enemy actions and intentions. Armed with knowledge about human

perceptual biases, we could reach an alternative conclusion that our enemy is just as vulnerable if we adopt an operational concept that views the chaos, complexity and uncertainty inherent in warfare as something that is to be exploited. By being aware of perceptual biases, we should be able to exploit this inherent weakness that all human beings possess. If, in our discussion of chaos and complexity, we change our focus from ourselves to our enemy, we should embrace deception and nonlinearity, as well as decentralization and dispersion as strengths. Through the application of these tenets, we can create an ambiguous picture for our enemy. We should be able to exploit his need for cognitive handholds and templates about our forces by not providing them. The US military should be looking to raise the level of uncertainty and ambiguity in our opponents, through a balanced application of technology, doctrine and organization. We should move to distributed and decentralized formations and operations that are not easily templated by our enemies. Development of deception and psychological operations capabilities need to be pushed to, and employed at, lower levels. Deception should be an operational tenant exercised at all levels of war. The overall intention of this would be to create mental or decision friction in our opponent, raising his overall chaos level to overwhelm his C2 and information processing organs.

Dupuy's insights into assimilation and congruency indicated that the methodology that we employ in the fielding of new technology has had impact on our overall success. The army should endeavor to field a smaller, fully digitized force to accelerate learning, building a reliable experience base, and lower cost. This would allow time to train and modify technology, doctrines, organizations, and logistics, and fully realize the full potential or limitations of future units of action and units of employment. Finally, a fully operational version needs to stand the test of actual combat and SASO environments before it is completely validated.

Given our current world situation, if we had fully digitized a smaller-sized unit i.e. a battalion combat team or even smaller versus a brigade combat team, we could have gotten it into the fight in Afghanistan, and would be gaining operational experience, as well as lessons to make it a more effective and efficient fighting force. The insight gained by the example of dual leadership found in the OPFOR organization indicates that new technology is not the sole method of improving informational processing on the

battlefield. The increased information processing capability discussed in the OPFOR method, unlike technological solutions, does not increase complexity, susceptibility to deception, or misinterpretation. In contrast, it allows for quicker assimilation and realization of the potential of information and new technology and makes the combat unit more mentally and physically agile on the dynamic and complex battlefield.

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VI.   DOCTRINAL AND OPERATIONAL CONCEPTS

A.   INTRODUCTION

Richard D Hooker Jr., in his article "Land Warfare: 21st Century Theory and Doctrine" (2000), astutely points out the connection between theory and doctrine. Theory, he believes, provides two essential elements for decision-making: a "mental picture of the battlefield", and "explanations of why and how things on the battlefield interact". "Theory is essential to understanding war because it provides a framework for understanding the battlefield and solving battlefield problems". To Hooker, "doctrine shows us "how to think about fighting"; it is " the link between theory and practice." With these definitions and relationships established, one can see the pivotal role that doctrine plays in success or failure in battle. Considering all that I have discussed so far, one can view doctrine as the glue that holds the operational constructs together. At various points in this thesis there has been discussion of attritional warfare and nonlinear or maneuver warfare; these are the two main theories of what essentially leads to victory.

The debate about doctrine and theories is continual. Currently, the concepts outlined by US Army doctrine appear to espouse the maneuver approach, focusing on surprise, agility, leadership, and the central role of the human dimension of warfare (Hooker, 2000). Though all this doctrinal rhetoric sounds maneuverist in its ideas, Russell F Weigley in his seminal work *The American Way of* War (1973) argues that in reality the US military is firmly tied to a mass firepower and attrition (he uses the term annihilation) style of combat. Edward N. Luttwak, in his article "Notes on Low Intensity Warfare"(1983), believes that all armed forces combine the elements of <u>attrition</u> and <u>relational maneuver</u> when dealing with warfare. Each military positions itself along an attrition/maneuver spectrum. Where they live on that specific spectrum will manifest itself in their operational methods, tactics, organizations, and potentially how they educate their officers.

> the closer they are to theoretical extreme of pure attrition, the more armed forces tend to be focused on their own internal administration and operation ... that of course is the correct orientation for an armed forces close to the attrition end of the spectrum. Because victory is to be obtained by administering a superior material resources, but there transformation

into firepower, and then by application of the ladder upon the enemy, the armed forces of that kind should concentrate on their own inner workings to maximize process efficiencies all around. (p. 336)

Luttwak goes on to point out the characteristics of attrition based militaries:

> "Armed forces with a high attrition content are supposed to optimize standard operating procedures for worldwide application because for them all wars are the same…Armed Forces with the higher attritional content must treat all their personal as interchangeable parts to maintain their efficiency… Armed Forces with a high attrition content operate within and arena of military action demarcated by externally set political guides…Armed Forces with a high attrition content must accord the dominant priority to logistics first of all, and then to the deployment, up keep, and utilization of the best-available means of firepower. (p. 340)

Luttwak's description should be very familiar to any US Army officer, as it seems an uncanny fit to the characteristics found in the US Army of today.

Gregory Wilcox in "Maneuver Warfare: More than a Doctrine" believes that the US Army maintains an attrition orientated mindset that robs it of mental and physical agility (as cited in Vandergriff, pp. 127). He believes that the Army continues to disregard the lessons learned about the need to shift to maneuver warfare (hallmarked by our failure in Vietnam) and continues to cling to a traditional attritional style. The results of this are tightly controlled operations (enabled by technology), the devolvement of leadership into management, and discouraging initiative among subordinate leaders through the requirement of compliance with strict rules, procedures, and processes. The upshot of all of this is that the US Army has become increasingly predictable to our enemies, and attritional thinking has been internalized into our very doctrine (p127). Of prime concern to Wilcox is the American passion for technology that disregards the human dimension of warfare as he states; "[The] RMA's focus on the science of war [information technology] and forsakes the soft side of psychology, theory and leadership" (p 155). Wilcox calls for an actual shift to a maneuver warfare concept and mindset that in his words "will give the services the agility and capability to deal with multiple compound-complex situations and win" (p. 160).   Finally, Chuck Spinney in his online article "Why Synchronization Dumbs Down Your OODA Loop"(March 15 2000) introduces the idea that the US Army has adopted a style of operations that he terms

"Synchronization Warfare" (SW) in lieu of true maneuver warfare. According to Spinney:

> SW is a methodical, analytic, top-down thinking process based on the assumption that the top-level commander can observe and orient himself to all the details on the entire battlefield. Given his god's eye view of the battlefield (enabled by C4ISR technology) the higher-level commander will be in the best position to make decisions on <u>What should be done</u> and <u>How it should be done</u>. The doctrine of SW aims to centralize decisions and achieve a unity of effort by giving the commander a detailed feedback control system so he can precisely regulate and control all activities of his subordinate units. (2000)

Though the US Army understands and to a certain degree ascribes to the theory of maneuver warfare, in practice it overemphasis on the doctrinal tenant of synchronization belies its being wedded to attrition warfare. Spinney envisions the future battlefield along the lines of Kosovo or Chechnya. As he sees it, future operational paradigms need to be based on "small cohesive teams operating under a "mission-orders" type organization", or in other words, maneuver warfare, or going something beyond maneuver.

It is crucial to understand, in terms of doctrine, what is out there besides the US Army's FM 3 <u>Operations</u> as a doctrinal foundation for warfare. A quick survey of the literature uncovers differing doctrinal solutions to the problems of current and future warfare. These include, but are not limited to, current Marine Corps doctrine, new joint concept of warfare--Rapid Decisive Operations (RDO), and finally the concept of "BattleSwarming". Each approaches the requirement of solving the problems posed by armed conflict from different perspectives.

B.   MARINE CORPS DOCTRINE

If we accept the argument that the current Army doctrine is conceptually centered on attrition as a basis of land warfare, then it would be logical to assume that the other land force maintained by America would have a similar theoretical and doctrinal baseline. Researching the Marine Corps doctrine, what is apparent is just the opposite. The Marines'doctrine is the closest thing to true maneuver warfare doctrine that exists in the US military. It maintains a clean and clear building-block approach to articulating a

theory of war and the doctrine to support it. The overarching publication is Marine Corps Doctrinal Publication 1 *Warfighting* (1997) which details a framework for how the Marine Corps views warfare. It discusses the nature of war: the problems, characteristics and demands of combat. It develops a theory of war based on that understanding. Based on this theory, it outlines the foundational concepts on how to prepare for and wage a war (1997, p. ii). The intent is that it is a document meant to be read cover to cover, not as simply a reference for facts about warfare, but rather to generate a shared understanding about essence of warfare and warfighting. According to the text:

> The essence of war is a violent struggle between two hostile, independent, and irreconcilable wills, each trying to impose itself on the other. War is fundamentally an interactive social process. Clausewitz called it a *Zweikampf* (literally a "twostruggle") and suggested the image of a pair of wrestlers locked in a hold, each exerting force and counterforce to try to throw the other.[4] War is thus a process of continuous mutual adaptation, of give and take, move and countermove. It is critical to keep in mind that the enemy is not an inanimate object to be acted upon but an independent and animate force with its own objectives and plans. While we try to impose our will on the enemy, he resists us and seeks to impose his own will on us. Appreciating this dynamic interplay between opposing human wills is essential to understanding the fundamental nature of war. (1997, pp. 3-4)

The style of the warfighting manual is clear, concise and well articulated as well as referenced. It is clear that the Marine Corps doctrine writers borrowed heavily from what has been written and discussed about war. The thoroughness does not stop there; to support the theory outlined in *Warfighting*, the Marines have manuals that outline *Strategy* (MCDP 1-1) detailing where the Marines and land warfare fit into the strategic picture of policy and politics. This is followed by *Operations* (MCDP 1-0), *Campaigning* (MCDP 1-2) and finally *Tactics* (MCDP 1-3). All of the manuals are in consonance with each other and create a fully integrated and unified vision of how to think about war. What is interesting to note is that the concept of Synchronization is only found in MCDP 1-0 *Operations* and then only talked about minimally. The following are a few ideas forwarded within the aforementioned texts:

> There is no shortcut to strategic wisdom. While some have predicted that the United States will be able to control the course of future conflicts through "information dominance" or a "system of systems," Marines continue to believe that people, not systems or machines, define success in

war. Success in military action whether at the strategic, operational, or tactical level will continue to depend greatly upon the judgment, experience, and education of our Marines. (*Strategy* MCDP 1-1 1997, p. 107)

Because war is characterized by chaos, uncertainty, and rapid change, control quickly breaks down. It is probably a mistake to speak of control in combat. MCDP 6 states that "given the nature of war, it is a delusion to think that we can be in control with any sort of certitude or precision." (*Tactics* MCDP 1-3, p. 91)

Efforts to fully centralize military operations and to exert complete control by a single decision maker are inconsistent with the intrinsically complex and distributed nature of war. (*Warfighting*, p. 13)

No level of war is self-contained. Strategic, operational, and tactical commanders, forces, and events are continually interacting with one another. Although we may view the chain of command as a hierarchical pyramid in which directives and power flow from higher to lower, in fact the command structure is often more like a spider web: a tug at any point may have an impact throughout the structure. (*Campaigning* MCDP 1-2, p.10)

At the present, Marine doctrine seems to be the most coherent and complete treatment of warfare. One could make the argument that the doctrine encompassed in these manuals is not specific enough and that because of it's size, the Marine Corps as a force is more focused on the tactical level of war and thus can afford to be more theoretical in its big picture doctrinal manuals. The US Army, on the other hand, has to be equally focused on the "nuts and bolts" of tactical doctrine, and because of its Division and Corps, Army organizations must have more explicit operational doctrine. The Army's FM 3 *Operations* is a useful document and is intended to be the overarching concept of how the Army prosecutes war. It does not fully articulate a comparable theory of warfare that is forwarded by the Marine Corps.

The importance of an articulation of a unified theory of war versus simply operations is subject to debate. Robert Leonhard in his book *The Art of Maneuver* (1991) premises that a well articulated theory of war provides three major pillars for a professional army. First, it helps avoid a fixation on doctrine to deal with one type of threat. Second, a comprehensive theory should provide latitude and adaptive thinking through shared understanding of warfare to deal with multi dimensional threats. Third, it

serves as the basis of debate among the professionals to fully develop ideas about alternative and new styles of warfare (pp. 237-238). Once again the argument is not that FM 3 is useless--it contains many of the ideas, concepts and principles that are relevant to warfare--it simply does not convey a unified theory of war. With the current movement to fully develop joint operations, which should produce a unified strategic and operational concept of how America will win on the battlefield, we need to turn our attention to the area of a concept of Joint Operations.

C.   RAPID DECISIVE OPERATIONS

Rapid Decisive Operations (RDO) is an ambitious attempt at establishing a joint operational concept that in time could translate into doctrine. It was developed by US Joint Forces Command (USJFCOM) to deal with the changing operational and strategic environment that will challenge US military forces in the future. RDO are based on four key characteristics: knowledge-centric, effects based, coherently joint, and networked force. The intent of this joint approach is that in future conflicts at the strategic level, the US will first focus elements of national power to <u>deter</u> and <u>influence</u> enemy action. If attempts fail, military forces will "rapidly and decisively <u>coerce</u>, <u>compel</u>, or <u>defeat</u> the enemy to accomplish (national) strategic objectives without lengthy campaign or extensive build up of forces"(p. 8). As the name implies, the key components of this concept are the rapid and decisive nature of these operations. According to the text (p. 9)

> **<u>Rapid:</u>** Accomplishing the objectives of the campaign as rapidly as possible. Speed being both absolute and relative to the adversary.
>
> **<u>To be rapid need</u>**
>
> - Knowledge: understand enemy and ourselves
> - Early planning & timely decisions
> - Compressed decision process
> - Ready, responsive C2 capability
> - Forward presence and rapid movement
> - Intense high tempo of operations
> - Tailored force and sustainment

- Responsive C2 system, established joint HQ element, compressed decision process

Decisive: Imposing our will on the enemy by breaking his coherence and defeating his will and ability to resist.

To be decisive need

- Knowledge: identify and effect that which is most valuable to enemy
- Effects based ops, employing full range of national capabilities
- Info superiority, dominant maneuver, precision engagement to apply synchronized precision effects to generate overwhelming shock
- Responsive C2 systems and shortened response cycle
- Relentlessness

The embodiment of the characteristics of RDO are functional and enabling concepts grouped into the 3 major categories consisting of <u>Knowledge</u>, <u>Command & Control</u>, and <u>Operations</u>. Each of these categories contains major functional and enabling concepts

Knowledge contains the overarching concept that the US will leverage superior knowledge to achieve decision superiority through a shared CROP, Joint ISR capability and finally Operational Net Assessment (pp. 16-21). The ONA is a relative new concept that is intended to provide understanding of our adversary's political, military, economic, social, infrastructure, and information systems and their inter-relations. This knowledge will then allow commanders to develop plans and strategies to achieve desired effects on the will and capability of our enemies.

Within the Command and Control category, RDO seeks to capitalize on information technology both in the ISR and in the command and control arenas. Central to the concept is the creation of a standing joint force headquarters (SJFHQ) that will practice adaptive joint C2 (AJC2), joint interactive planning (JIP), as well as developing new collaborative processes with multinational partners and the civil interagency community (pp. 21-28). This idea of standing joint headquarters is not that new. Macgregor, as described in chapter III, forwarded a form of this. The twist would be that this element would now be embedded in the CINCs staff. Conceptually, the standing C2

element will benefit from habitual relationships, shared experience in parallel planning and collaboration created by day to day operations and training. It will develop the ONAs prior to crisis and during crisis would "adapt" to fit several different JTF C2 configurations (figure 12) ranging from designated JTF HQ to Primary JTF staff to a forward deployed element of the CINC's HQ (p. 24).
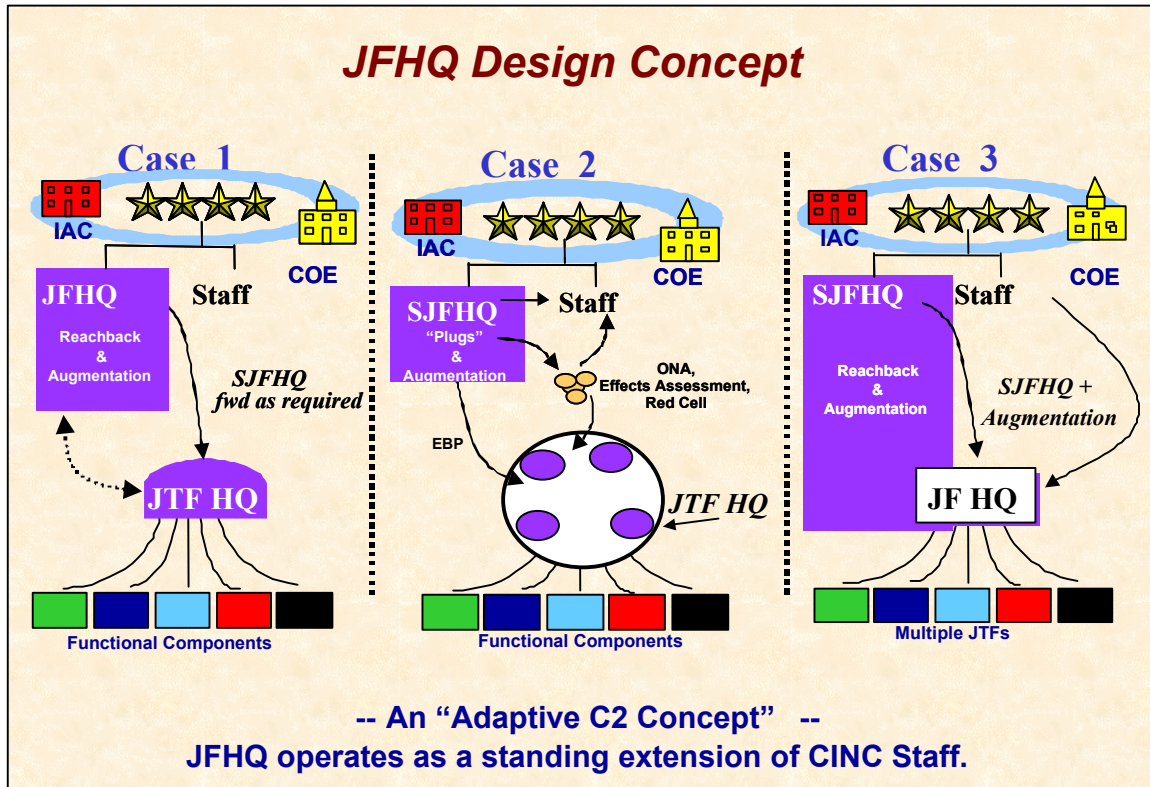

Figure 12.   Adaptive Joint C2 concept[6]

Joint Interactive planning and interagency and multinational collaboration seem to be based on some type of information sharing network that provides "collaborative planning" automated "decision support" tools, with modeling and simulation capabilities to help decision makers analyze COAs and resulting outcomes. Finally, the C2 system will foster "dynamic planning" in the sense that it will update information on plans and operations to ensure an up to date shared awareness is maintained within the JTF. As envisioned (figure 13), this process of "dynamic planning" will integrate the multiple OODA loops to produce a parallel collaborative information environment. This will enable the increases in the speed of command e.g. getting inside your enemy's decision

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[6] This graphic copied from RDO Whitepaper 2.0 (2001) p.24

cycle due to superior information processing and sharing that turns information into action (Cebrowski, 1998) and decision superiority, by decreasing the amount of time it takes for all elements relevant to decision making to complete an integrated OODA loop (pp. 25-26).
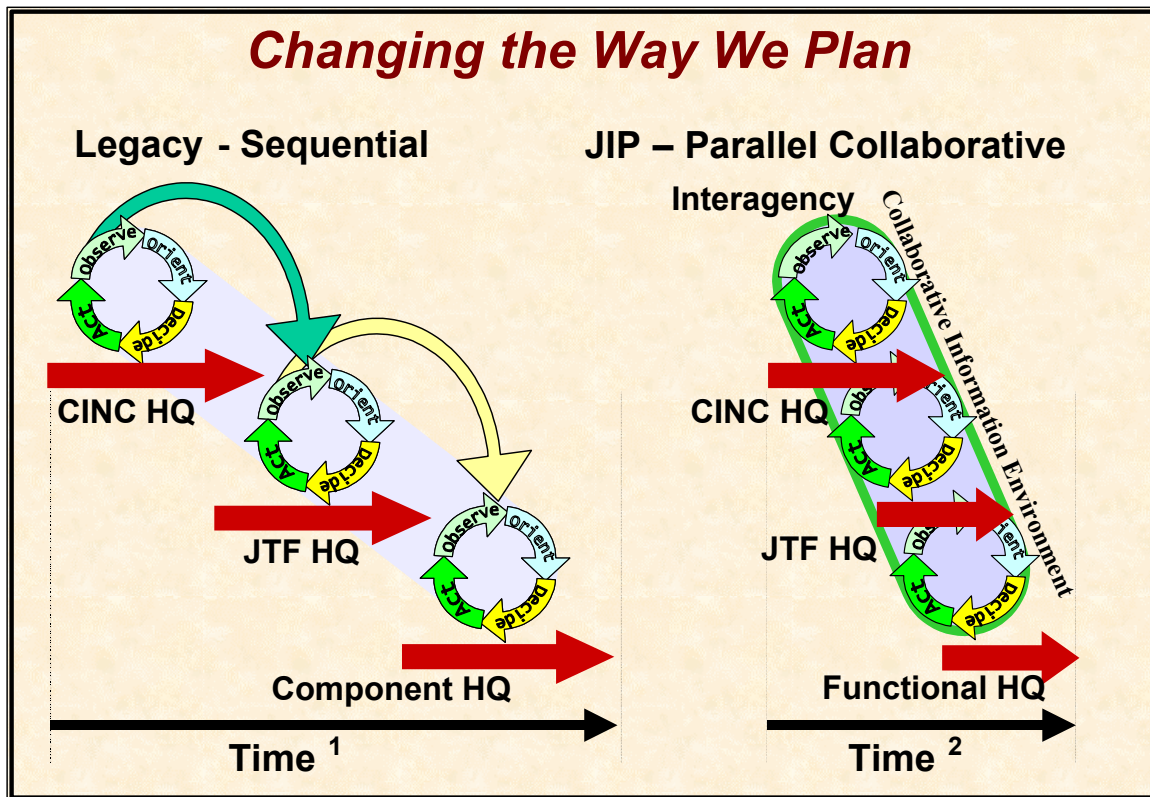

Figure 13.   Joint Interactive Planning Concept[7]

Within the operations category, the focus is to maximize effects on the enemy through the integration of dominate maneuver, precision engagement and information operations. The support for Effects Based Operations (EBO) comes from a plethora of operational enablers, which include "assured access, rapid force deployment, agile sustainment operations, and full dimension protection" (p. 28).   According to the concept, EBO will be able to seize and control initiative and tempo using surprise and speed of maneuver force to achieve desired effects, and creating opportunities for the employment of precision lethal and non-lethal "fires" anywhere on the battlefield.

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[7] This graphic copied from RDO Whitepaper 2.0 (2001) p.25

Simultaneously, Information Operations (IO) will support with either electronic and or influence effects. The text points out the desirable nature of IO effects in crisis and peace:

> IO possesses unique characteristics desirable for use in peace and crisis. These characteristics includes low collateral damage, little or no deployment requirements, little or no in-theater presence, relatively rapid response to tasking, low risk to personnel, potentially large effect(s) for a small effort, and target specificity (means of precise engagement). Its success depends on the same knowledge capabilities, operational net assessment, operational planning, and robust joint intelligence surveillance and reconnaissance, which are key to dominant maneuver and precision engagement. (pp. 30-31)

The doctrine places all three elements of EBO (dominate maneuver, precision engagement and information operations) on the same footing with the understanding that priority and combinations of all three will be dependant on the desired effect to be achieved within a certain situation or set of circumstances.

As a doctrinal solution to challenges of the future strategic environment and the emergence of adaptive adversaries, RDO seems on the surface a step in the right direction. I must applaud the efforts to develop new concepts and the shift to joint operations as the centerpiece of our warfighting capability. RDO attempts to address the inter-service friction that Admiral Owens points out as a major obstacle for real transformation by breaking down service specific functional boundaries to reach new and more effective mixes of information, forces and command and control. The concept of moving to integrate the joint military arena and the interagency and multinational arenas is right on target. Conflict in not a one-dimensional problem that is effectively solved solely by the application of military force. RDO seeks to integrate the use of all aspects of national power to fight and win future conflict.

What is troubling is that the RDO concept is clearly enabled largely by a technical system of systems whose real battlefield effectiveness is unknown. Unlike the Marine Corps doctrine, which is a purely conceptual and theoretical interpretation of how war is to be fought, based on historical perspective, RDO requires huge cognitive jumps that new technology will provide the commander the ability to turn information to understanding. Throughout the document, there are numerous references to how information technology, CROP and joint ISR systems enable all of the characteristics

required for RDO, but the intellectual foundation of the concept has no historical basis, and is propped up by simulation, computer modeling and experimentation. Though all of these analytical methods on the surface are valid in the final analysis, they are simple tools that approximate reality, not truly reflect it. The entire treatment of increasing the speed of the OODA loop process seem to fit the American perception that "faster is better". What is counter-intuitive is that result of out thinking the enemy in this fashion can lead to misinterpretation and self-deception. Professor Thomas Barnett of the Naval War College points out the problem in the article "The Seven Deadly Sins of Network-Centric Warfare"(1999) when he states:

> Most worrisome are network-centric's assumptions (That just because we can Observe, Orient and Decide faster we have to Act faster) concerning getting inside the enemy's decision loop. Makes sense as a goal, but the real focus should be on what we do inside, not just on blind pursuit of faster response times. Why? We are always talking about potential enemies with less advanced information technology architectures, so the potential for miscommunication and misperception is huge. We may find ourselves acting so rapidly within our enemy's decision loop that we largely are prompting and responding to our own signals, which our beleaguered target cannot process.

Further, though the concept of the interagency integration is a valid one, in actuality it is beyond the scope of what DoD can actually effect. Though the military might want to integrate these partners, we have no authority over them making the whole concept. Short of placing the CINC (DoD) or an Ambassador (DoS) to be overall in charge of all elements of national power within a country or operational theater, there is really no way to realize rapid decision making. Finally, the price tag of the Global Information Grid (GIG) which will serve as the backbone that will tie all of these various system together is in question: Who will fund this? In this time of limited budgets, I question whether any service is willing to foot the bill while still maintaining their combat capabilities. It is true that we have cut the Crusader, but several more "big ticket" items will have to be sacrificed for the technical infrastructure to enable RDO.

The intent here is to point out that here is a certain level of hidden pitfalls for any doctrine that requires a total reliance on technological capabilities that have not matured. Further, I do not advocate shunning technological advances or concepts enabled by them

solely because of limited experience. What needs to be clear within the army is that what is envisioned in RDO are untested concepts that we believe will make the US better, but require huge investments of time and money. The question in the end will be what is the return on the investment? There are currently alternative conceptual approaches that could prove more effective in the short and long term that are enabled by improvements in technology.

D.   SWARMING: AN ALTERNATIVE APPROACH

The two major ideas for future operational concepts are represented by "Convergent Assault", discussed by Bevin Alexander in his book *The Future of Warfare* (1995) and "Swarming" advanced by John Arquilla and David Ronfeldt in their book *Swarming & the Future of Conflict* (2000). In addition to these ideas, there has been increased experimentation regarding ways to increase the capability and effectiveness of small units. These include the Marine Corps "Hunter Warrior" "Hunter Networks" concepts and DARPA's Small Unit Operations SUO study. To simplify matters I have decided to narrow the focus to discussing the operational concept of Swarming primarily because as a doctrine it could be considered the most radical, and from my research is the best developed.

In their book, Arquilla and Ronfeldt lay out an operational concept found in nature as well as in actual combat--that of "swarming". It is the ability of "the small and the many" to defeat "the large and the few" (Libicki, 1994). Their ideas are based on the notion that the information revolution is changing the way people fight (2000, p. 4), with trends toward the networked organization, the decoupling of range and accuracy of conventional weapons, the increased lethality of the small unit as well as a required for further dispersion on the modern battlefield. According to the authors:

> We envision the development of new kinds of small military units called "pods" (platoon size) that can operate in "clusters" (company size). These units should be dispersed to mitigate the risk posed by hostile fire. Yet they would feature great mobility, modest logistical requirements, and "topsight" (i.e., they will know much of what is going on in the overall campaign- as will their top commander). Possessing both mobility and situational knowledge, they will be able to strike, swarming from all directions, either with fire or in force. (p. 6)

As they see it, "BattleSwarm" doctrine is part of natural military operations evolution due to advances in information processing and structuring. The result is a steady movement from the <u>melee</u> to <u>massing</u> to <u>maneuver</u> and finally to <u>swarming</u>. These operational concepts are not mutually exclusive but instead build on each other and even coexist within the environment of war (p. 7). Arquilla and Ronfeldt explain this evolution and show historical examples of each of the operational concepts (Chapter. 2). Further, they detail the instances of swarming, first in nature (bees, ants and wolves), and then throughout military history. Major examples of this are Mongol cavalry and bow employment, American Minutemen, German U-boats, and the RAF in the Battle of Britain (pp 29-30, 33). In more recent instances of swarming, they cite Vietnam--US swarmed fires, VC/ NVA swarmed force, Chechnya--Chechens swarmed fire and force. Haiti--US swarmed force, and Somalia--Aidid swarmed force (p. 37). In essence, swarming as a form of warfare is nothing new. As was established earlier, the trend in warfare is to move from high intensity/conventional to low intensity/irregular type conflict and the current information revolution (rise in the power of networked organization). This seems to create the conditions for not only a move to swarming as a mode of battle, but makes it more effective than what has been experienced in the past. Instead of turning away from it, the US should fully develop its own doctrine of swarming (pp. 43-44).

So, what are the characteristics and elements of swarming? The basic characteristics are as follows (p. 21):

- Autonomous or semi-autonomous units engaging in convergent assault on a common target
- Amorphous but coordinated way to strike from all directions-- "sustaining pulsing" of force or fire
- Many small, dispersed, internetted maneuver units
- Integrated surveillance, sensors, C4I for "topsight"
- Stand-off and close-capabilities
- Attacks designed to disrupt cohesion of adversary

By applying these characteristics as design elements, the result would be small, dispersed maneuver units with some level of internetted connectivity. These units will most likely need to be joint to allow mixing and matching of stand-off and close-in capabilities. To

maintain situational knowledge, "topsight" is provided to commander and peer maneuver units by a C4ISR network (pp. 45-46). As described in the text (p. 46):

- **Aim**: "sustainable pulsing" of force and /or fire

- **Result**: amorphous but coordinated way to strike from all directions-- stealthy ubiquity, no "front"

- **Tenet**: centralized strategy, decentralized tactics, distributed formations and logistics

The authors then map out a path that the military could follow that deals with the requirements needed to create a swarming operational concept, and the vulnerabilities that would have to be addressed. The first major change would be the move from large hierarchically structured combat units to small, networked units. The move would have to be made to some type of networked structure, most likely a "star" or "all channel" formation (p. 58-60). The units (pods), as mentioned earlier, would be small and mobile, and could be like units with like function, mixed units with mixed capabilities, or at the "cluster" level an integration of differing functions to crate a multipurpose capability (p. 61). The connectivity that would bind this network together requires a technological component, but more important is finding the right balance of control or decontrol, and the regulation of the amount of information flow and sharing. This becomes an issue of how to structure information versus processing it. Second, the technology base to support this would have to be hardened and robust to safeguard against disruption. The primary focus would be denying or defending against enemy tactics or weapons that could affect the flow of information within the system (p. 70). The concept of Information Operations (IO) and information dominance thus becomes central to creating the conditions for swarming. Equal training and resources would have to be devoted to how we affect the enemy's information by how we protect our informational structure. As the text points out (p 69):

> The second core element in information operations relates to managing the stocks and flows, contents and conduits, of one's own informational resources. This is generally less emphasized aspect of IO-- but is likely to be of great importance to the success of swarming doctrine. For a swarming field operation to succeed the units of maneuver must be able to <u>relay on uninterrupted flow of useful information</u>-- i.e., both information <u>processing and structuring must be assured</u>. This may enable the swarm force to prevail even against an adversary whose own information flows

are not disrupted; because the swarm will still be able to <u>target the enemy</u>, <u>pulse to attack</u>, <u>dissever</u>, and then <u>recombine for continued assault</u>.

Adopting the doctrine of "BattleSwarm" fits right into the current direction that the US military is moving. It optimizes the potential of network organization and the concept of information operations. To achieve the right mix of close and stand-off capability it requires jointness. It can be used throughout the spectrum of conflict (high intensity/conventional to low intensity/irregular). Of equal importance, the smaller distributed forces will be less expensive, logistic intensive, and vulnerable to enemy PMG threat. Both Arquilla and Ronfeldt recognize that there are major challenges ahead to fully realize swarming, and as a doctrine, it will not emerge overnight. The question now becomes how viable the doctrine of swarming is for the US military.

Unlike RDO, the authors have fully researched and supported their argument, through outlining a long historical record of successful instances of swarming. If all that data is not strong enough, I believe there is an example of swarming operations being conducted on a monthly basis by US Army forces, with very successful results. This same case additionally provides clear, irrefutable insight into the vulnerability of our large hierarchical combat structures. The example that I am speaking of is the monthly training exercise conducted at the Joint Readiness Training Center (JRTC), and the swarm force is the 1/509th Airborne Infantry Battalion, which serves as the OPFOR.

Anyone who has experienced the Low Intensity Conflict (LIC) phase should realize that the OPFOR, in effect, is conducting highly intense swarming by force and fire. The scenario is such that one or two companies of OPFOR are pitted against a US light, airborne, or air assault brigade, which results in devastating losses for the larger unit. The technique is simple: the OPFOR concentrate on hitting high pay-off targets within the rotational brigade. High on their list are C2 elements, fire support structures (Q36 fire finding radar), and communication (Multi Subscriber Equipment) and logistic (water purification units) nodes. This is accomplished through fires or forces that continually hit, retreat, regroup, and hit again--the very same idea as "sustainable pulsing". Though very low tech in connectivity, these dispersed teams of OPFOR require a very low information content and flow, due to clear mission order, shared understanding of intent and key to success. Their information processes are hard to

detect and exploit rapidly enough to disrupt their effectiveness. Thus, the argument that the US army has no workable experience with swarming is not based in fact.

To some, swarming seems a huge jump from our current operational concept and is based on ideas that may or may not have fully matured. As discussed in the chapters on organization and technology, the US embraces the ideas of the power of information, and networked organizations at the highest levels of authority. The US military is well on its way to creating the technical architecture to support these ideas. After all, what is the purpose of the digitized battlefield but as a method to share information and increase the quality of our decision making process in combat? In comparison to RDO, the technical requirements for swarming seem simplistic (the C4ISR networks already exist), and there is no requirement for the full digitization of the joint service and interagency process here. Further, due to the small size of the units, it maybe more economically feasible and quicker to develop and field swarm forces than create the six IBCT's that the Army has planned for. The major obstacle then seems to be more of a cognitive one within our own minds then that of a technical, organizational, or doctrinal nature. Maybe it is really more about the terms used by Arquilla and Ronfeldt that make swarming seem so different. The chaotic connotations that visions of swarms of bees or fire ants bring to mind seem uncontrollable and down right foolish. The maneuver units of "pods" and "cluster" do not fit comfortably into our historical notions of the size, authority and purpose of platoons, companies, and battalions. In reality, military transformation is about changing people's minds and perceptions about what is not only possible but also what is acceptable.

E.   CONCLUSION

What does this discussion mean in terms of the path for transformation of the US Army? First, I believe that it shows us that there is a well-developed, well-articulated maneuver doctrine in the form of the US Marine Corps that conceptually could be adopted, which provides a much better framework for how to think about war. It fundamentally accepts the notions of the chaos tenets addressed in chapter two. It provides a theory of warfare that is crucial to developing a shared understanding of how war is to be fought. One could argue whether the Marine Corps actually practices what it preaches, but that is not the point. The important fact is that, for doctrine to be useful, it

has to be understandable and simple to operationalize, or the result will be, as I believe has occurred in the U.S. Army, that our doctrine is sound but not understood and internalized by our soldiers and leaders due to the fact that it is poorly structured.

The second major concept is that doctrine needs to be based on actual experience-- preferably one's own experience-- and actual achievable technical capabilities. I understand the need to experiment with new concepts, and RDO falls into this category. The problem comes from the fact that after a certain point, the line between experimentation and operational reality becomes so blurred that there is a danger that we will adopt technology, doctrine, and organization that have been validated by simulation, but never put to the hard test of combat. Some may argue with this, but it seems intuitively better to field a smaller operational version of a force, which can be tested as a fully functioning complex system, versus a larger experimental version where key systems within the system are at various stages of actual capability. With the latter model, to experiment or exercise the whole larger system there is a pressure to incorporate surrogates, or simulation, to achieve a desired capability, just to use the system in the simplest of exercises. At times, this is difficult for the Army to do. The Interim Brigade Combat Team (IBCT), from the perspective of the Army, is a small and manageable organizational structure to field. Judging from the fact that even within the IBCT organization, some of the units and equipment cannot be digitally tracked (they don't produce an icon on the FBCB2). Certain desired capabilities, in this instance "Netfires", that is the autonomous clearance of fires from digital situational awareness, can never be realized.

Why not create a fully digitized Battalion Combat Team where all combat, combat support and service support elements track digitally. Field it and exercise it now, with the ability to exercise and examine capabilities such as "Netfires". As important if not more important is figuring out how to harden all the soft portions of any combat unit. As pointed out, an enemy swarm force will focus on massing on the critical subsystems of any combat structure, striking communications, logistics, sensors and fire support. If a smaller force was fielded along with all of its supporting elements, the Army could more accurately determine methods to fix this major vulnerability via changes in doctrine, organization, and technology. We could fully explore the capabilities and limitations of

the smaller combined arms team, and collect data that supports or refutes our assumption that Brigades are the optimal combat organization. I believe we will find that by moving to a smaller unit of action we will be able to fully realize its combat potential due to the fact that we will be able to increase the frequency and level of training that can be conducted.

The third major concept is that the US Army needs to move from attrition to a maneuver style of warfare, "BattleSwarm" could be a method to help achieve this evolution. Once again swarming, as an operational concept, can coexist with maneuver and attrition styles on the battlefield. As was proven in the first several months of Operation Enduring Freedom in Afghanistan, the effectiveness of small, distributed units applying precision force to the battlefield worked very well. This is also evident by the engagements in Operation Anaconda. Mass and firepower retain a significant role at the engagement level of combat. The idea then would be the integration of the two styles, maneuver and swarming, within the same operational setting.

To achieve this, a dedicated and standing swarming force needs to be created. It would have to be able to work with elements of all the services, and thus would need to be of a joint nature. It would rely on mobility and the integration of advance C4ISR systems, with the direction of elements of precision force achieving desired effects on the enemy. Currently, the US could conduct swarming operations with special operations forces (Rangers, Special Forces and SEALs), and support them with conventional forces conducting maneuver and stability operations. Afghanistan. or subsequent campaigns, could be used as the laboratory for really developing the tactics, techniques and procedures to operationalize these concepts. What this would do is to essentially place our enemies on the horns of a dilemma: either to mass against the small, dispersed swarm forces or disperse against the larger, more fixed, conventional maneuver force. In any case, it would present a style of operations that the US military are not known for, and would initially be difficult to template and fight against. It would also allow for the development of trust between SOF forces and conventional forces, as well as confidence in "Battle Swarm" operations in the military's senior leadership. As mentioned earlier, changing doctrine is mainly about changing the way a group thinks about waging war. Conditions seem to be right to capitalize on Dupuy's idea of congruence between the

weapons of war and the methods of war. The US military currently possesses the advanced weapons of war (PGMs, advance C4ISR systems), what we need is a congruent method of war to fully realize the latent combat potential that exists within the US military. I contend that method should be the doctrine of "BattleSwarm".

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VII. CONCLUSION: AN ALTERNATIVE PATH FOR TRANSFORMATION

Given the ideas and concepts discussed throughout this thesis, there is a strong current of thought that points out the need for an alternative approach to transformation within the US Army. This approach could be based on a theoretical foundation that warfare is fundamentally chaotic in nature. The ideas and concepts outlined by not only historical military thinkers Clausewitz, Sun Tzu and Jomini, but also 20th century theorists Liddell, Hart and Fuller, point to a nature of war that embodies the Chaos tenets of nonlinearity, multi, quasi-stable states, fractalism, and sensitivity to initial conditions. These then can be interpreted as underlying design parameters that should guide our military in its approach to systematic and fundamental change.

If we believe that we have moved out of the industrial age and into the information age, there is a call to examine, and alter, all three major military dimensions--organization, technology and doctrine--to generate innovative change. Logically, the changes made within each of these areas have complementary and non-complementary effects on each other. The key, then, to transformation is the holistic approach to solving the problem. Each dimension or aspect of the warfighting enterprise should be adjusted to create harmony between theoretical concepts and practical implementation. This balance, as pointed out by T. E. Dupuy and Williamson Murray, should be based on historical examination. Real innovation and change within the military is based less on technological improvements than on changes in organization and doctrine. It therefore becomes a matter of how to adjust and change how soldiers and leaders perceive war, and the solutions to problems posed by uncertainty, complexity, and psychology. The reality of tranformational change within a traditions-based institution is about changing the way the institution thinks, and then creating a supporting culture that fosters those ideas and concepts. Any change to the organization, technology, or doctrine will have a deeper implication than simply a modification to the specific area. For instance, organizational change brings with it a fundamental imperative to change the nature of the supporting personnel system. Doctrinal and technological changes affect the supporting educational and training structures, methods and priorities.

The Army understands all of this, as reflected in its adherence to a unified and synchronized approach for developing a total system that develops doctrine, training, leadership, organization, material, soldier, and analysis (DTLOMSA), as a methodology to address every aspect of a new system or technology. The whole transformation framework, which maintains a legacy force, fields an interim force and develops an objective force, is a method of maintaining capability while simultaneously changing. The problem seems to be at some point one has to let go of the familiar and tested structure, technology, or doctrine, and pick up an innovative and unproven one. That transition seems to be the most difficult for institutions. In the business world, where profits and market share are the measures of success, and can be tracked on a monthly balance sheet, innovation and new approaches are tested in a competitive environment that works quickly to reinforce what works and culls out what doesn't. in the military world, there is no daily or monthly test of competing systems because the competitive environment of war is a much rarer occurrence

Where should the US Army go from here? Clearly, we have embarked on the path of technological transformation, but seem to have lost our theoretical and historical anchoring. At the time that we embracing great technological change, we are still clinging to the larger hierarchal organization of the ground combat unit. If we follow the path that the chaos tenets establish, we should fundamentally embrace the chaotic environment, and structure our transformation path toward exploiting its opportunities and sidestepping its limitations. Changes should then be focused on improving our abilities for success within a dynamic and complex environment. A balanced approach to transformation should be followed with measured amounts of change or adjustment across all three dimensions of military structure: organization, technology, and doctrine. To do this we need to adjust our military culture. If we apply chaos tenets, they guide us down a path toward flexible organic and humanistic methods to make us better at warfare. This terminology may sound very "touchy feely" to some, but certainly, within the realm of ground combat, the central issue is to produce a system that optimizes the performance of human beings in warfare. Let us review the tenets of chaos and what they appear to illuminate.

Nonlinearity: The idea that inputs have disproportional effects on a system requires the need for real understanding of the enemy and the nature of the conflict, and the circumstances in which both friendly and enemy forces find themselves. It is not sufficient for this understanding to be maintained at the CINC or JTF level, but rather must permeate the entire warfighting enterprise, from platoon, company, and battalion. The leader at the pivotal point on the battlefield (in the position to effect and be responsible for the action) needs to be able to make decisions and freely communicate intentions, as well as exploit opportunities as they present themselves. It is then incumbent on the higher commander to follow that lead, and actively support tactical and operational imperative of exploitation and pursuit.

Fractal: The idea that strategies tend to work on many different levels in war. Strategies need to be tried at low levels to judge the effectiveness within acceptable risks. Concepts that work at higher levels should be pushed as low as possible--effects cell /deception cell, and joint interagency fusion cells are structures that could be tried at brigade, and possibly battalion level. New force mixes should be tested, exemplified by shifting balance between fire and maneuver forces. Integrated functional teams that interface at low levels could help to integrate capability and exploit opportunities that are presented on the battlefield

Multi-quasi-stable states: The fact is that combat units need to be able to transition between peace and war, thus all units within the army need to be hardened to enemy action. Drawing from the example of the US Army Rangers, all members of the unit, regardless of function or position, has to have the capability of not only defense but also offense. Soldiers and leaders have to understand the precarious nature of perceived periods of cessation of conflict. Low-threat psychological engagement of disenfranchised populations is necessary to building report, and further developing cultural and regional understanding.

Sensitive to initial conditions: This translates to getting there early with self-sufficient forces that pose credible combat power, and the mobility and authority to use that power. The bottom line is that because of this idea, it becomes much more important to get, and have the ability, to influence disputes before they become armed conflict.

Important to this concept is that forces that are deployed need to be unified in command and vision about how to achieve solutions through lethal and non-lethal power.

What then should the recommendations be for changing the path of transformation? I believe that there is a requirement for change within all three dimensions of military structure that are outlined in this thesis.

What I have laid out is a conceptual and operational approach for choosing an alternate path for the transformation of US Army ground forces. Foremost, the US Army needs to adopt a unified theory of warfare. Many of these concepts already exist. I would advocate a study of the Marine Crops' doctrinal manuals as a model, and then a simple synthesis and adjustment of the doctrinal concepts that already exist within the knowledge base of the US Army. The only major change would be an incorporation and further development of the doctrine of "BattleSwarm" into our current concepts. This idea is in keeping with the understanding that warfare has multi-stable states, thus different operational concepts can and do coexist within all combat. US Army units already thoroughly execute attrition style battle--we need to fully incorporate maneuver and swarming into our repertoire of operational styles. This will provide the US solutions to the major problems of strategic operational and tactical mobility, as well as differentiated forces that can be utilized throughout the spectrum of conflict. Having said that, certain forces and modes of operations are more appropriate for different types of conflict i.e. what works in mid-intensity conflict does not work for low intensity or irregular type warfare.

Organizationally, the Army's current transformation strategy can be maintained with the creation of dedicated swarm-type forces utilizing swarming doctrine and associated techniques and procedures. This force, along with SOF, would conduct advance force type operations to develop the situation and implement shaping operations, utilizing the application of a mix of effects based strategies--Psyops, information operations and precision force. These would be applied early, as conflict is sensitive to initial conditions to deter and coerce enemy forces. Working in conjunction with the small, distributed unit would be a larger maneuver force. The larger force would be more conventional in nature, and designed to conduct a broader range of military operations.

Thus, the overall operational concept would be a mixture of tactical/operational swarming, supported by operational/strategic maneuver (once again maneuver as a doctrinal concept versus the movement connotation). This strategy would address the problem identified with swarming - how to sustain it and the fact that at the lowest level that quantity (mass) has a quality all its own. Small distributive forces are susceptible to the melee and attrition tactics that the larger maneuver force can withstand. By combining a mix of both methods, the result would be an integrated force that has the ability to conduct forced entry to disrupt and fix the enemy, while simultaneously identifying the best area where a follow-on, self-sustaining force can expand from. The result could be multiple points of entry and expansion in a given theater, decreasing the threat that long-range, precision guided and low intensity terrorist actions present to single point lodgment. The maneuver forces would create an infrastructure to support the swarming force, and by leap-frogging the two styles of operations, provide the enemy with an asymmetrical threat. To capitalize on the synergies created by this mix of operational concepts, both the swarm and maneuver elements should exist within the same organization. As experienced in the past in Grenada and Panama, SOF forces can provide a great deal of flexibility, agility and shock to an operation, but have the problem of securing and sustaining day to day military operations. Though our SOF units are extremely effective, there is very little integrated training with conventional Army units, which lowers the effective integrations of these units (a factor exemplified by operations in Somalia). The friction between the recommended swarm and maneuver elements described should be resolved by creating combined swarm/maneuver combat teams where teamwork and trust can be developed and exercised.

Our discussions of the organizational dimension points to the need for small, organic, combined and joint units of action. These units would have the natural joint plugs to fit into the JTF form of warfare. I would recommend, as other have, the need for a standing joint headquarters. Undoubtedly, the more each subordinate functional element understands what it provides to the warfighting enterprise, as well as its requirements from all the other sub-elements, allows mutual adjustment to provide the best output for the total organization. Currently, the Army envisions the brigade combat team as the unit of action for ground combat. Although this is entirely prudent, the move

to smaller, self-contained combat forces seems necessary, if only to establish the true optimized size combat force. Toward that end, a battalion or smaller-sized combat team could be created and tested. This would solve the major problem of strategic mobility. The idea would be to create a rapidly deployable self-supporting force that possesses operational and tactical mobility and is economical enough to train at a level and frequency that builds effectiveness. It could be created from the sub elements of one of the IBCTs, or could be a stand-alone force. This would create a rapidly deployable interim force that could be exercised and deployed to operational contingencies to gain experience, and test technology and doctrinal concepts, the first being an integration of swarm force with conventional maneuver force. A small force may yield new insights to increase the rapid tailoring of the IBCTs for future conflict and contingency, and adaptation of the doctrine organization and technology for objective force, which is based on operational experience.

Finally, the US Army's investment in technology should be predicated on creating systems that logically fit the way human being interact, perceive their world, and develop and create knowledge. The technologies should empower how we structure our information, versus simply focusing on speeding up processing. To fully realize the potential of any of these technologies, people need the time to build up extensive experience sets to confirm or deny effectiveness. Systems need time to grow in experimentation, but to really be considered useful they need to be fielded and exercised through operations. Complexity should be a major consideration when choosing new technologies, and it seems better to procure simple, robust technology that provides one or two capabilities well, than a system of systems that attempts to do everything good but nothing well. Currently, the digitized battlefield system of systems needs to exercised, refined and adjusted, versus adding anything new. Only in that way can we really determine its real contribution to increased combat power.

In this thesis, I have established that there are alternative bodies of knowledge, concepts, and methods to transform military forces. Many of the ideas that are discussed are not new; in fact, a majority of thoughts are simply universal intuitions that many soldiers and leaders in the US military have had. If we can learn anything, it is probably the lesson that the US military has a history of innovation, and applying what works to

the battlefield. We are arguably the most powerful military force of our time. However, this power is a double-edged sword--it allows us to safeguard our way of life, but has contributed to a perceived casual understanding of warfare, and the organizations, technology and doctrine that support it. There is an analogy that is often heard when discussing change: that like an antelope on the savannah, you don't have to be faster than the lion, you just have to be faster than at least one other antelope. Carrying this over to warfare, it is then not about reaching your full combat potential; it is simply about being slightly better than your enemy. Because of our overwhelming military power, we make the mistaken assumption that we will retain our edge, and continue to be just slightly better than our enemy. Our technology is the best, our doctrine is sound and our organization has been battle tested. All that is needed for transformation is an upgrade to what we already do so well. I disagree with this philosophy. This is the reason that we are still wedded to attrition as a form of war. This is why, though we have the best soldiers in the world, we continue to try to develop technological "silver bullets" that will reduce their need for training, experience and education. This is why our approach to transformation is more about evolutionary change at the margins, instead of revolutionary changes at the core of how we think about and fight war. The time is right to leave the simple and orderly approach to warfare behind, and embrace chaos and complexity as our allies in an attempt to fully realize the combat potential of US Army combat forces.

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LIST OF REFERENCES

Alexander, B (1995) *The Future of Warfare*. New York, NY: W.W. Norton & Company

Arquilla, J. and Ronfeldt D. (2000) *Swarming & the Future of Conflict*. Santa Monica, CA: RAND National Defense Research Institute

Arquilla J. and Ronfeldt, D. (1997) *In Athena's Camp: Preparing for Conflict in the Information Age*. Santa Monica, CA. RAND National Defense Research Institute

Barrnet, T (1999) "Seven Deadly Sins of Network Centric Warfare" retrieved February, 14, 2002 from http://www.nwc.navy.mil/dsd/7deadl~1.html

Beyerchen, A.D. (1992) "Clausewitz, Nonlinearity and the Unpredictability of War" *International Security*, 17:3 pp 59-90

Bolman, L. and Deal, T (1997) *Reframing Organizations: Artistry, Choice and Leadership*- 2nd Edition. San Francisco CA: Jossey-Bass Publishers

Cezerwinski, T. (1998) *Coping with the Bounds: Speculations on Nonlinearity in Military Affairs*. Washington D.C.: National Defense University

Cebrowski, A. and Garstka, J. (1998) "Network –Centric Warfare Its Origin and Future" *Proceedings of the United States Naval Institute,* January 1998, pp.28-35

Cohen, E.A., Eisenstadt, M.J. and Bacevich, A.J. (1998) *Knives, Tanks & Missiles': Israel's Security Revolution*. Washington D.C.: Washington Institute for Near East Policy

CSBA Online (2002) "The Emerging RMA" Retrieved January 20, 2002 from http://www.csbaonline.org/2Strategic_Studies/2Emerging_RMA/Emerging_RMA.htm

Dupuy, T.N., (1987) *Understanding War: History and Theory of Combat*. New York, NY: Paragon House Publishers

Dunnigan, J. F. and Nofi A.A. "Deception Explained, Described, and Revealed." as cited in Psychological Operations and Deception Vol. Three: Deception Naval Post Graduate School SO3102 reader Spring 2002

Galbraith, J. (1995). *Designing Organizations*. San Francisco CA: Jossey-Bass Publishers

Grange, D., Czege H.W., Liebert, R., Jarnot, C., Sparks, M., (2000) *Air-Mech-Strike: 3-Dimentional Phalanx*. Paducah, KY: Turner Publishing Company

Gray, C. (Spring 1996) "Changing Nature of War" *Naval War College Review*

Heuer, R.J. "Cognitive Factors in Deception and Counterdeception" as cited in Psychological Operations and Deception Vol. Three: Deception Naval Post Graduate School SO3102 reader Spring 2002

Jervis, R. (1976) *Perception and Misperception in International Politics*, Princeton, NJ. Princeton University Press

Keller, B. (March 10 2002) "The Fighting Next Time" *The New York Times Magazine*, pp.32-37, 48,59,68,72.

Knox, M. and Murray, W. (2001) *The Dynamics of Military Revolution, 1300-2050*. Cambridge and New York: Cambridge University Press

Leonhard, R. (1991) *The Art of Maneuver: Maneuver Warfare Theory and AirLand Battle*. Novato CA: Presidio Press

Leonhard, R (2001) "Classical Fires Support vs. Parallel Fires" *Army*, pp 47-50

Lewin, R. (1992) *Complexity: Life at the Edge of Chaos*. New York, NY, Collier Books

Libicki, M. (1994) *The Mesh and Net: Speculations on Armed Conflict in a Time of Free Silicon*. Washington, D.C.: National Defense University Press

Liddell Hart, B.H. (1954). *Strategy*. New York, NY: Fredrick A Praeger, Publishers

Luttwak, E "Notes on Low-Intensity Warfare" *Parameters*, December 1983

MacGregor, D. (1997) *Breaking the Phalanx: A New Design for Land Power in the 21st Century*. Westport, CT: Praeger Publishers

MacGregor, D. (2001) "Resurrecting Transformation for the Post-Industrial Era" *Defense Horizons* September 2001, pp 1-8

Mintzberg, H. (1993) *Structure in Fives: Designing Effective Organizations*. Englewood Cliffs, NJ: Prentice Hall

Murray, W. and Millett, A.R (1996) *Military Innovation in the Interwar Period*. Cambridge and New York: Cambridge University Press

Nicholls, D. and Tagarev, T (1994) "What Does Chaos Theory Mean for Warfare" *Airpower Journal* Fall 1994 retrieved March 5 2001 from http://www.airpower.maxwell.af.mil/airchronicles/apj/apj94/nichols.html

O'Hanlon, M. (2000) *Technological Change and the Future of Warfare*. Washington DC: Brookings Institution Press

Owens, B. (2000) *Lifting the Fog of War*. New York, NY: Farrar, Straus, and Giroux,

Pape, R. (1996) *Bombing to Win: Air Power and Coercion in War*. Ithaca NY, Cornell University Press

Rosenau, W. (2001) *Special Operation Forces and Elusive Enemy Ground Targets*. Santa Monica, CA: RAND National Defense Research Institute. ,retrieved May 12 2002 from http://www.rand.org/publications/MR/MR1408/MR1408.ch3.pdf

Rosenberger, J. (1999, May-June) "Reaching Our Army's Full Combat Potential in the 21st Century" *Armor.* retrieved March 8, 2001 from http://knox-www.army.mil/center/ocoa/ArmorMag/mj99/3rosen99.pdf

Spinney, C. (15 March 2000) comment no.348, "Why Synchronization Dumbs Down Your OODA Loop,", retrieved March 29 2002 from http://www.infowar.com/iwftp/cspinney/c348.htm

Summers, H. Jr. (1982) *On Strategy: A Critical Analysis of the Vietnam War*. Novato CA: Presidio Press

Vandergrift, D.E. (2001) *Spirit, Blood, and Treasure: The American Cost of Battle in the 21st Century*. Novato, CA: Presidio Press

Von Clausewitz, C. (1984) *On War* (M. Howard, and P. Paret, Ed and Trans.) Princeton NJ, Princeton University Press (Original work published 1816-1818)

Van Creveld, M. (1985) *Command in War*. Massachusetts and London: Harvard University Press, 1985.

Van Creveld, M. (1991) *The Transformation of War*. New York, NY: The Free Press

Joint Warfare of the US Armed Forces Joint Pub 1 (Feb 1991 (revised Jan 1995) U.S. Government Printing Office, Washington D.C.

Joint Vision 2020 (2000) U.S. Joint Chiefs of Staff, U.S. Government Printing Office, Washington D.C.

Warfighting MCDP 1 (1997) Department of Navy, U.S. Government Printing Office, Washington D.C.

Strategy MCDP 1-1, (1997) Department of Navy, U.S. Government Printing Office, Washington D.C.

Operations MCDP 1-0 (2001) Department of Navy, U.S. Government Printing Office, Washington D.C.

Tactics MCDP 1-3 (1997) Department of Navy, U.S. Government Printing Office, Washington D.C.

Campaigning MCDP 1-2 (1997) Department of Navy, U.S. Government Printing Office, Washington D.C.

Operations FM 3 (2001) Department of Army, U.S. Government Printing Office, Washington D.C.

Rapid Decisive Operations (2001) USJFCOM, J9 Joint Futures Lab White Paper, USJFCOM,

Army Battle Command System (ABCS) Version 6.2 Smart Book (2001). Fort Hood Texas. Retrieved August 14, 2001 from: fttp://150.114.141.248

Force XXI Battle Command Brigade and Below (FBCB2) (2001). Fort Hood Texas. Retrieved August 14, 2001 from: fttp://150.114.141.248

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